NATAL RESEARCH INSTITUTE
8 SEP 1959
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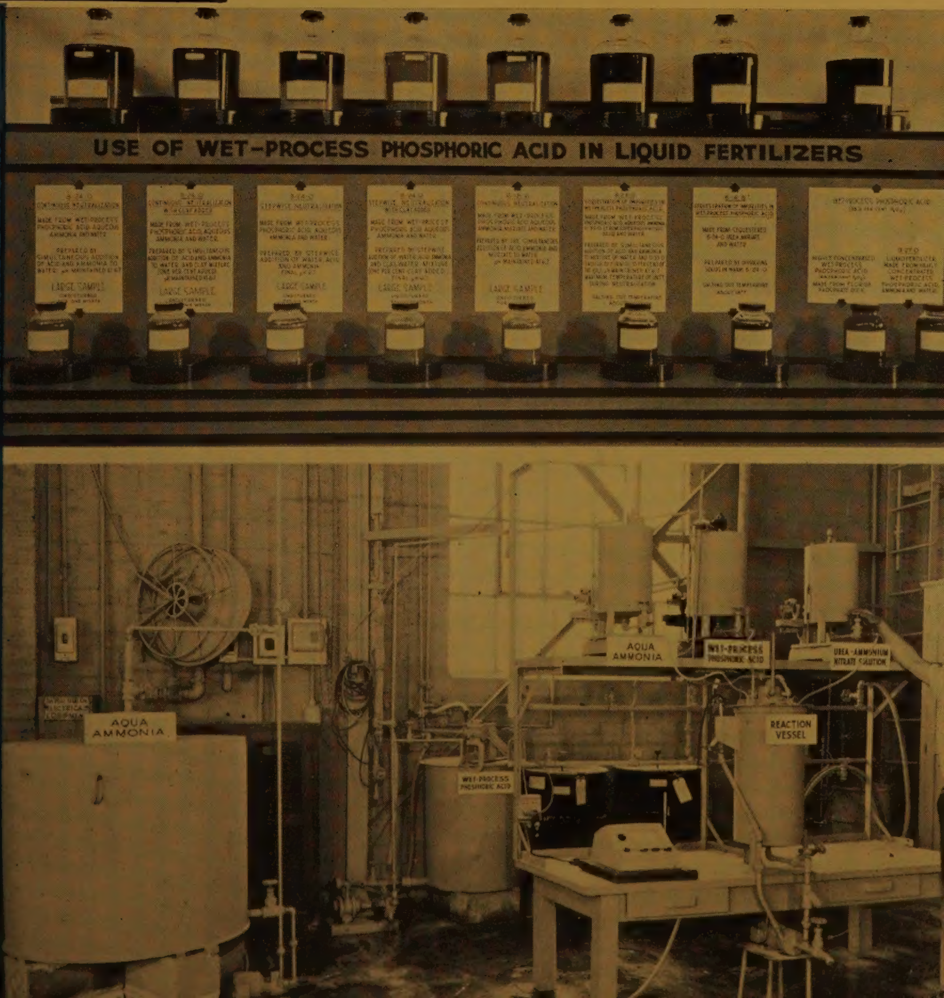
AGRICULTURAL *Chemicals*

N
HIS
UE:

- Selecting Fertilizer Solutions
- Pesticides vs Wildlife
- Nitrogen Losses
- Pesticide Regulation
- Screening Fertilizer
- Pesticide Exports
- Safe Pesticide Handling


USE OF WET-PROCESS PHOSPHORIC ACID IN LIQUID FERTILIZERS
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AUGUST, 1959

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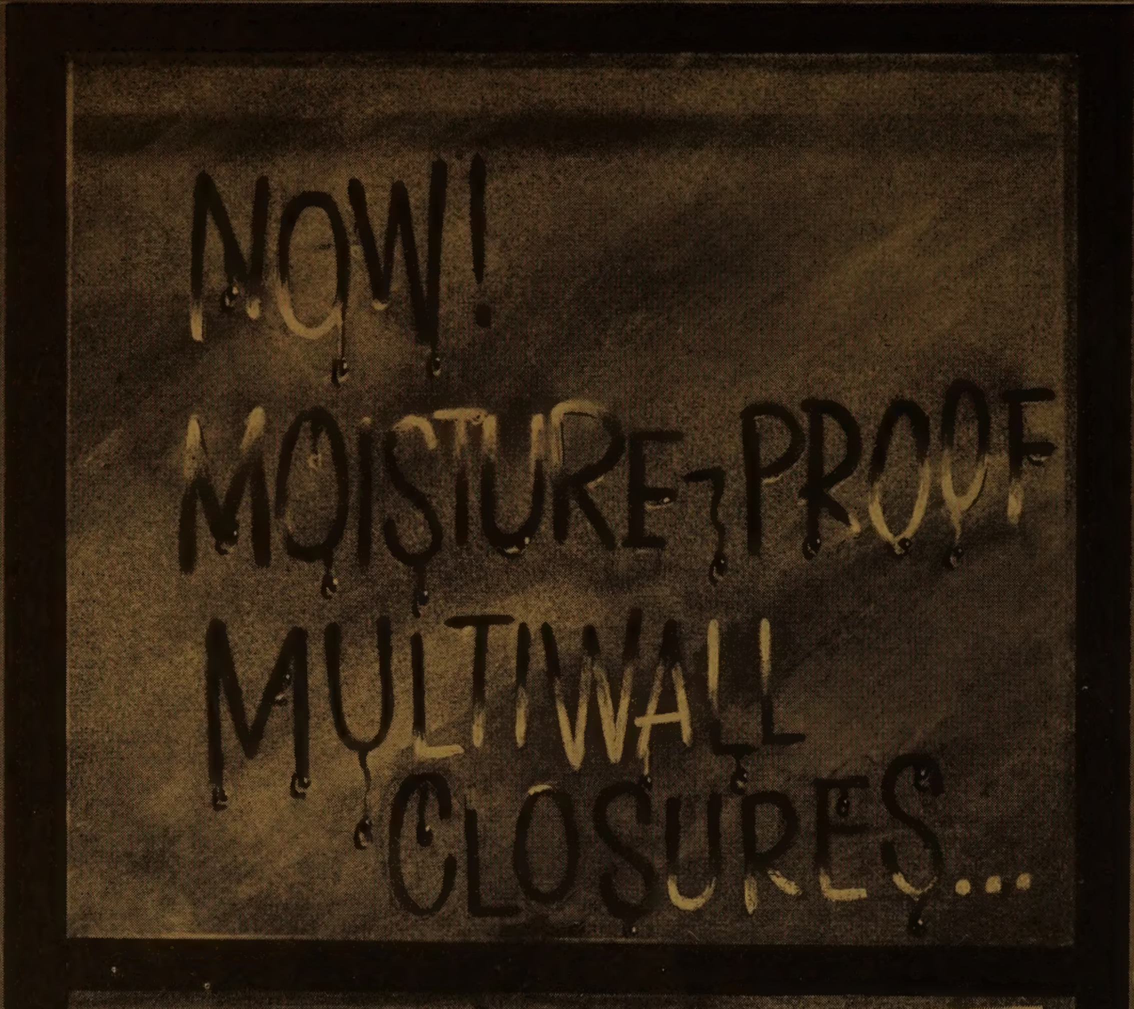

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Vol. 14, No. 8 **August, 1959**

AGRICULTURAL Chemicals

ARTICLES

TVA PILOT PLANT DEMONSTRATIONS — CONCLUSION 32
PACIFIC ESA ELECTS H. MANIS AS CHAIRMAN 35
AMMONIATING SOLUTIONS 37
By Grant C. Marburger
INSECTICIDES FOR PEST CONTROL vs HAZARDS TO WILDLIFE 41
By C. H. Hoffman
LIQUID FERTILIZERS FROM WET PROCESS PHOSPHORIC ACID 43
SCREENING GRANULATED MIXED FERTILIZERS 46
By L. M. Leach
PESTICIDES — THEIR REGULATION 47
By J. Noone
A TRACTOR MOUNTED FUMIGANT APPLICATOR 57
By Paul M. Eide
AERIAL SPRAYING IN GREAT BRITAIN 59
By R. C. Amsden
CONTINUOUS STUDIES OFFER SAFETY FOR APPLICATORS 60
By Ralph F. Glasser

FEATURES

IN THE SPOTLIGHT THIS MONTH 8
INDUSTRY CALENDAR 28
EDITORIALS 31
TECHNICAL SECTION 50
FERTILIZER VIEWS AND NEWS 52
By Vincent Sauchelli
THE AGRICULTURAL APPLICATOR 55
THE LISTENING POST 63
By Paul Miller
PEST ROUNDUP 65
By Kelvin Dorward
WASHINGTON REPORT 66
By Donald Lerch
INDUSTRY NEWS 71
PROFESSIONAL DIRECTORY 101
CLASSIFIED ADVERTISING 103
ADVERTISERS INDEX 105
TALE ENDS 106

This Month's Cover

Continuous TVA neutralization process, using 10-gallon reactor for production of liquid fertilizer with wet process phosphoric acid. See story on page 43 of this issue.

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MEMBER AUDIT BUREAU OF CIRCULATIONS

PUBLISHED monthly on the 1st, by Industry Publications, Inc.

ADVERTISING and Editorial Office, P. O. Box 31, Caldwell, New Jersey.

PUBLICATION Office: 123 Market Pl., Baltimore, Md.

ENTERED as second-class matter November 4, 1949 at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

SUBSCRIPTION RATES: United States, 1 year, $3.00; 2 years, $5.00. Canada and Pan American countries, 1 year, $4.00; 2 years, $7.00. All other foreign countries, 1 year, $9.00; 2 years, $15.

SINGLE COPIES: current issue: $0.50; all back numbers $1.00. Postage and handling charges for foreign countries on single copies: $1.00. Claims for missing numbers will not be allowed if received more than 60 days from date of mailing. No claims allowed from subscribers arising from failure to notify the Circulation department of a change of address, or because a copy is "missing from files."

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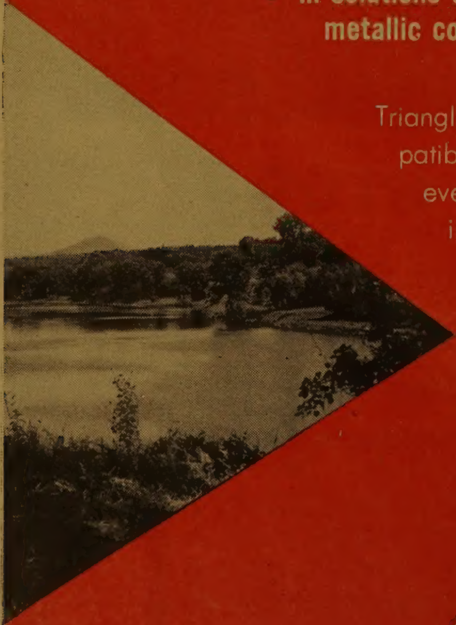

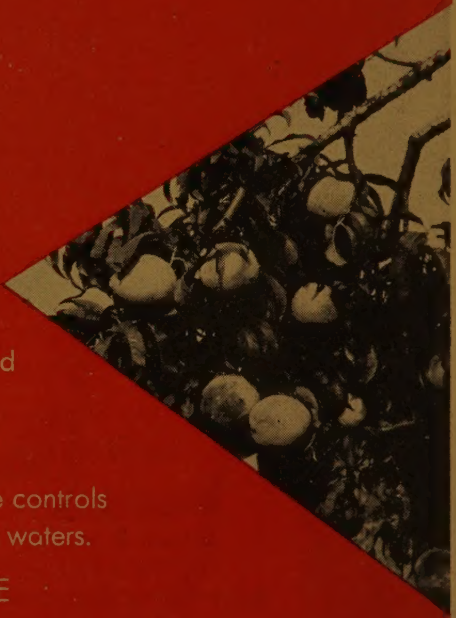

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National Plant Food Institute, 1700 K St., N.W., Washington, D. C. Paul Truitt and Russell Coleman, executive vice-presidents.

American Potash Institute, 1102 16th St., N.W., Washington 6, D. C. H. B. Mann, president.

American Society of Agronomy, 2702 Monroe St., Madison, Wisc. L. G. Monthey, executive secretary.

American Phytopathological Society, S. E. A. McCallan, secretary. Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn. Jack Criswell, executive vice-president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. Hugh Horn, secretary-treasurer.

California Fertilizer Association, Sidney Bierly, executive secretary, Room 213, Ochsner Building, 719 "K" Street, Sacramento, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City. Dr. H. W. Hamilton, secretary.

Entomological Society of America, 1530 P. Street N. W., Washington, D. C. R. H. Nelson, secretary.

National Fertilizer Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

National Cotton Council, P. O. Box 9905, Memphis, Tenn.

Soil Science Society of America, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

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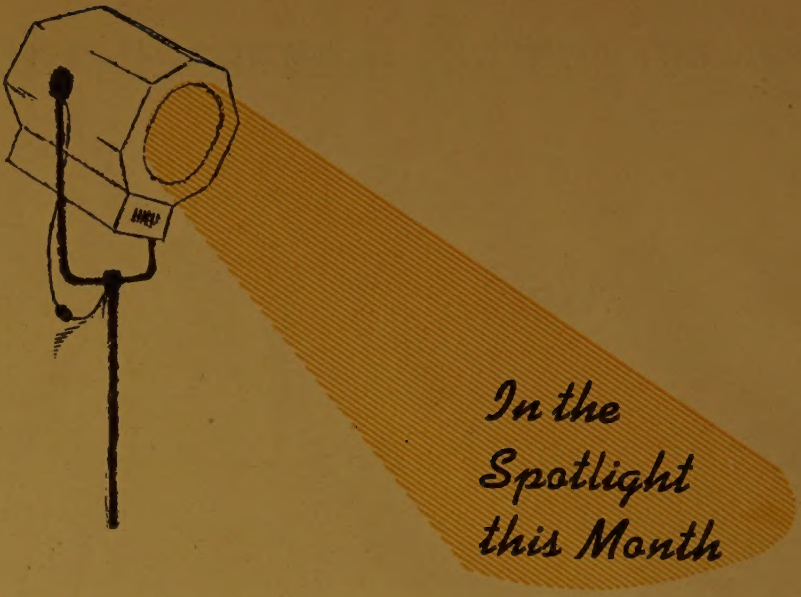

In the Spotlight this Month

- **Nitrogen Losses . . .** High nitrogen losses and heavy fuming at plants using large-scale TVA ammoniators are found to be due largely to "scaling-up" pilot plant data. Suggested correction includes redesign of distributor, and adjusting formulations and operating conditions to avoid overgranulation. Page 32.

- **Public Relations in Pesticide Industry . . .** The conclusion of our 3-part series on the question of "Are Insecticides Required for Insect Control Hazardous to Aquatic Life?" — deals with industry's responsibility in educating the pesticide applicator to the hazards involved and the precautions to be taken in handling agricultural pesticides. Page 41.

- **The Correct Nitrogen Solution . . .** The one most important characteristic in choosing a nitrogen solution is its free-ammonia content. Other factors to take note of are: the salting out temperature, vapor pressure, and water content. Page 37.

- **Pesticide Regulations . . .** Nematocides, defoliants, plant growth regulants, and desiccants will shortly be included under the Federal Insecticide, Fungicide and Rodenticide Act, if the U. S. Senate approves H.R. 6436. Some observations on pending legislation and need for legislation covering new classes of agricultural chemicals are reported. Page 47.

- **Fertilizer Manufacture . . .** Theoretically, it would seem that screening between the drying and cooling operation might offer several attractive features, — in practice however, the disadvantages encountered convince the plant superintendent that screening after cooling is more desirable. Page 46.

- **The Agricultural Applicator . . .** Included in the section are articles that describe a tractor-mounted fumigant applicator — aerial application in Great Britain — research into the safe handling of pesticides — a demonstration of three agricultural airplanes — and a comparison of fixed-boom and air-blast sprayers. Page 55.

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LETTERS to the EDITOR

TO THE EDITOR:

The similarity of names, products manufactured, and the same state has occasionally resulted in unfortunate cases of mistaken identity in situations where one name has been assumed to be the other.

The latest of these came about when it was announced in your publication that the "Michigan" Chemical Corporation has discontinued manufacture of DDT.

We, the "Michlin" Chemical Corporation, are going great guns and have expanded our sales into more parts of our country—with new insecticide formulations along with our major volume in DDT solutions.

Arnold Michlin
MICHLIN CHEMICAL CORPORATION
Detroit, Mich.

TO THE EDITOR:

Please send me the names of manufacturers of liquid fertilizers in small packages for home owner consumption.

Jack E. Duitch
LEVENSON CHEMICAL CO.
Omaha, Nebr.

TO THE EDITOR:

I am contemplating going into the liquid fertilizer business. Any plans or information you have available for a small to medium sized plant would be appreciated.

If you are unable to supply me with any information in this connection, would you please forward my request on, or advise me where I might obtain such information?

G. H. Gorrell
1759 Wavell Street
London, Ontario

● Perhaps some of our readers can provide the information Mr. Duitch and Mr. Gorrell require. Ed.

We were very interested in the article in *Agricultural Chemicals* for January, 1959, on the bulk fertilizer operations of Wilson & George Meyer & Company of Los Angeles. We would appreciate it very much if you could let us have their address, as we would like to ask them if they can let us have some more information on the type of equipment they have found best for the work and how they organized the service.

C. G. Saunders
FISONS PEST CONTROL LIMITED
England

We found Hagen and Smith's article, "Chemical and Biological Methods of Pest Control," in the July 1958 issue of *Agricultural Chemicals* of particular interest to this office.

R. J. Kowal
FOREST INSECT RESEARCH
Asheville, N. C.

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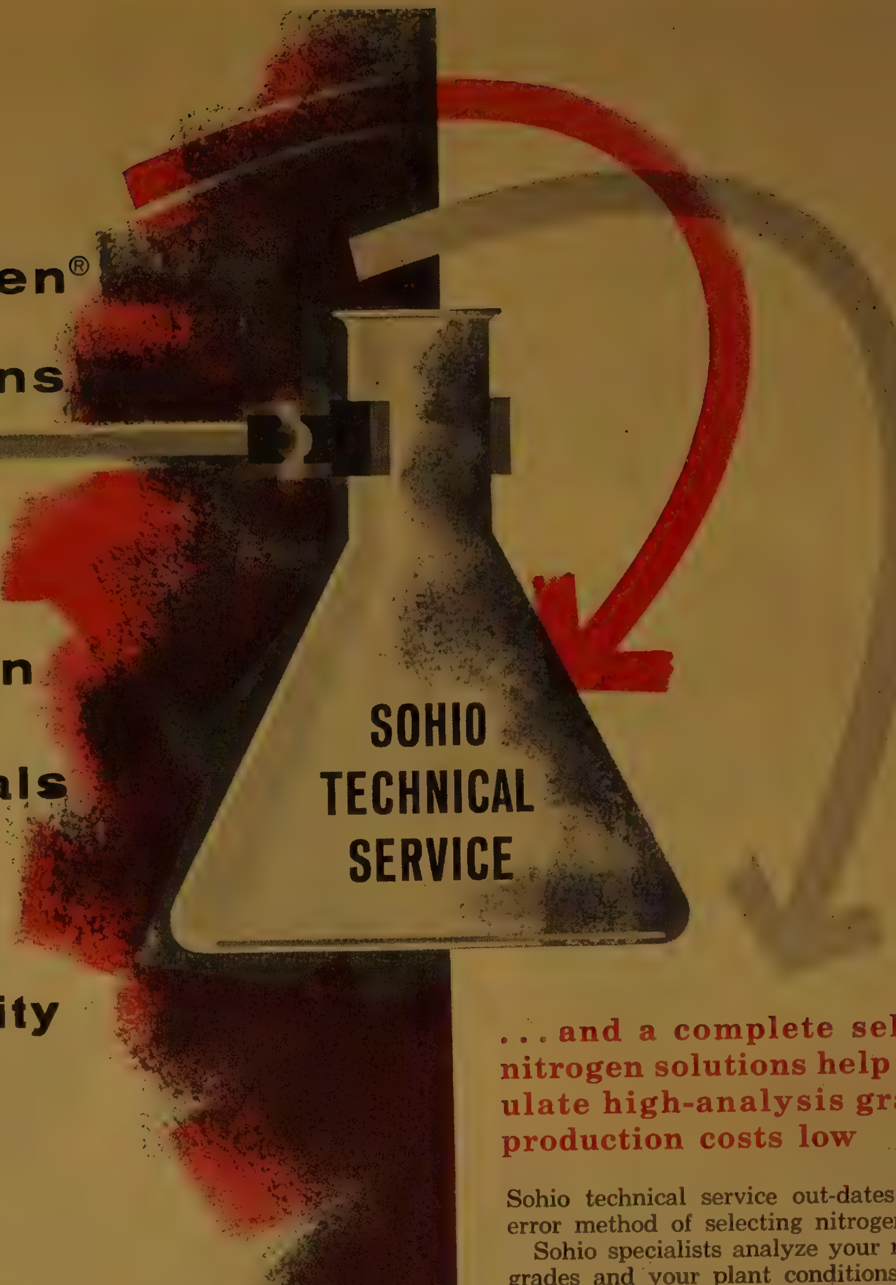

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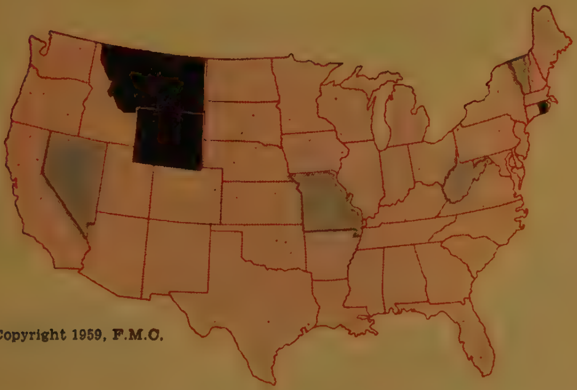

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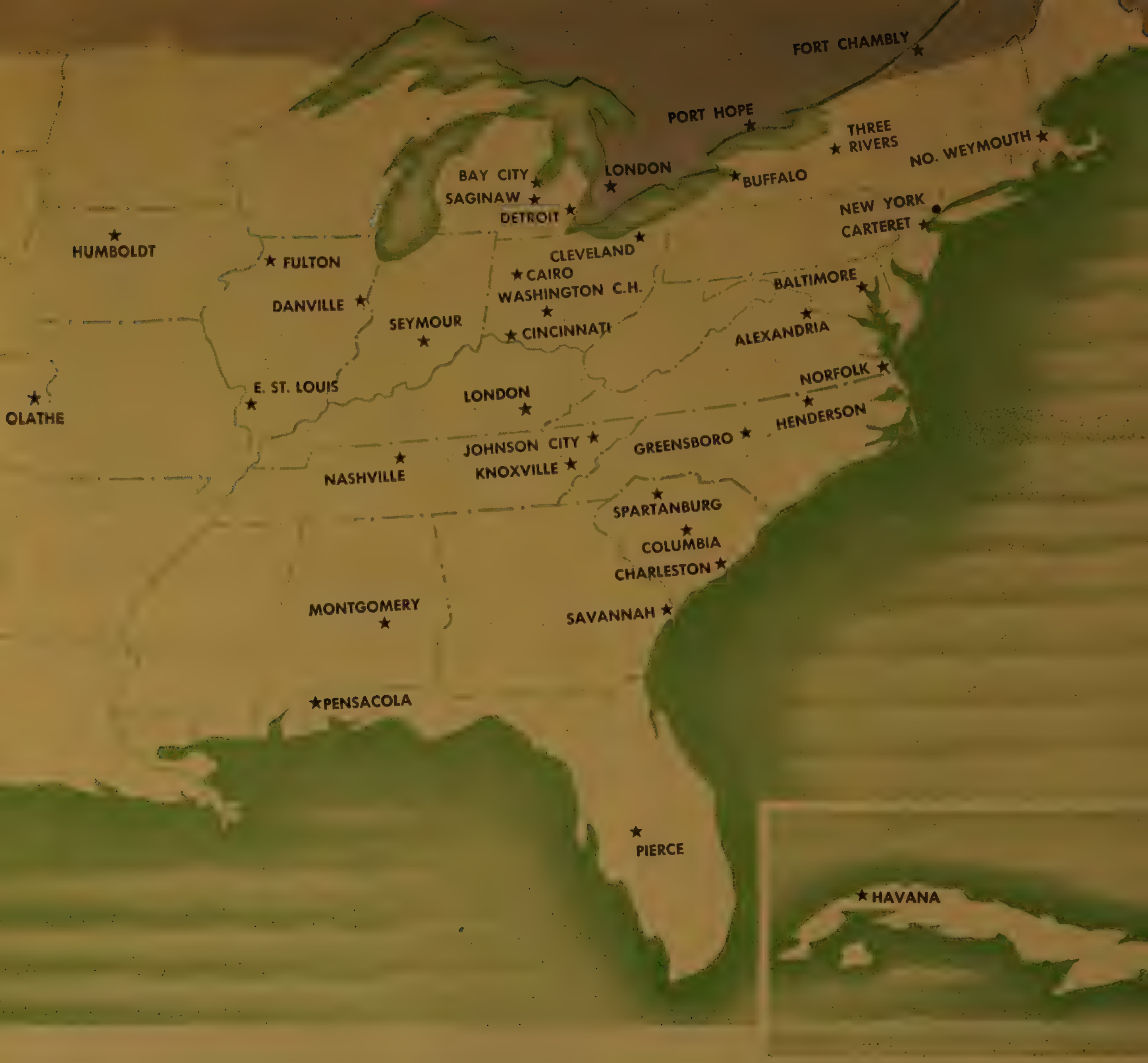

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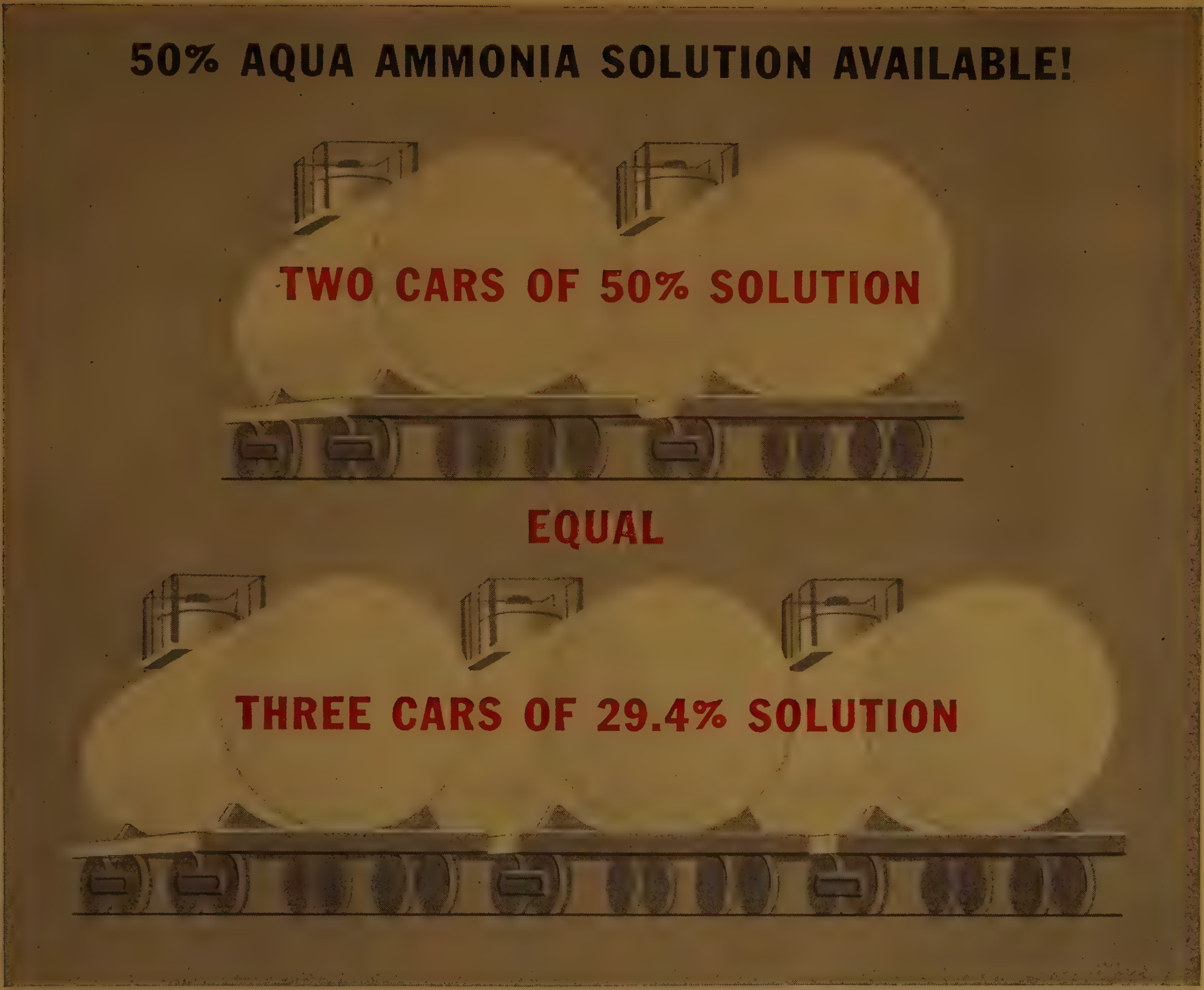
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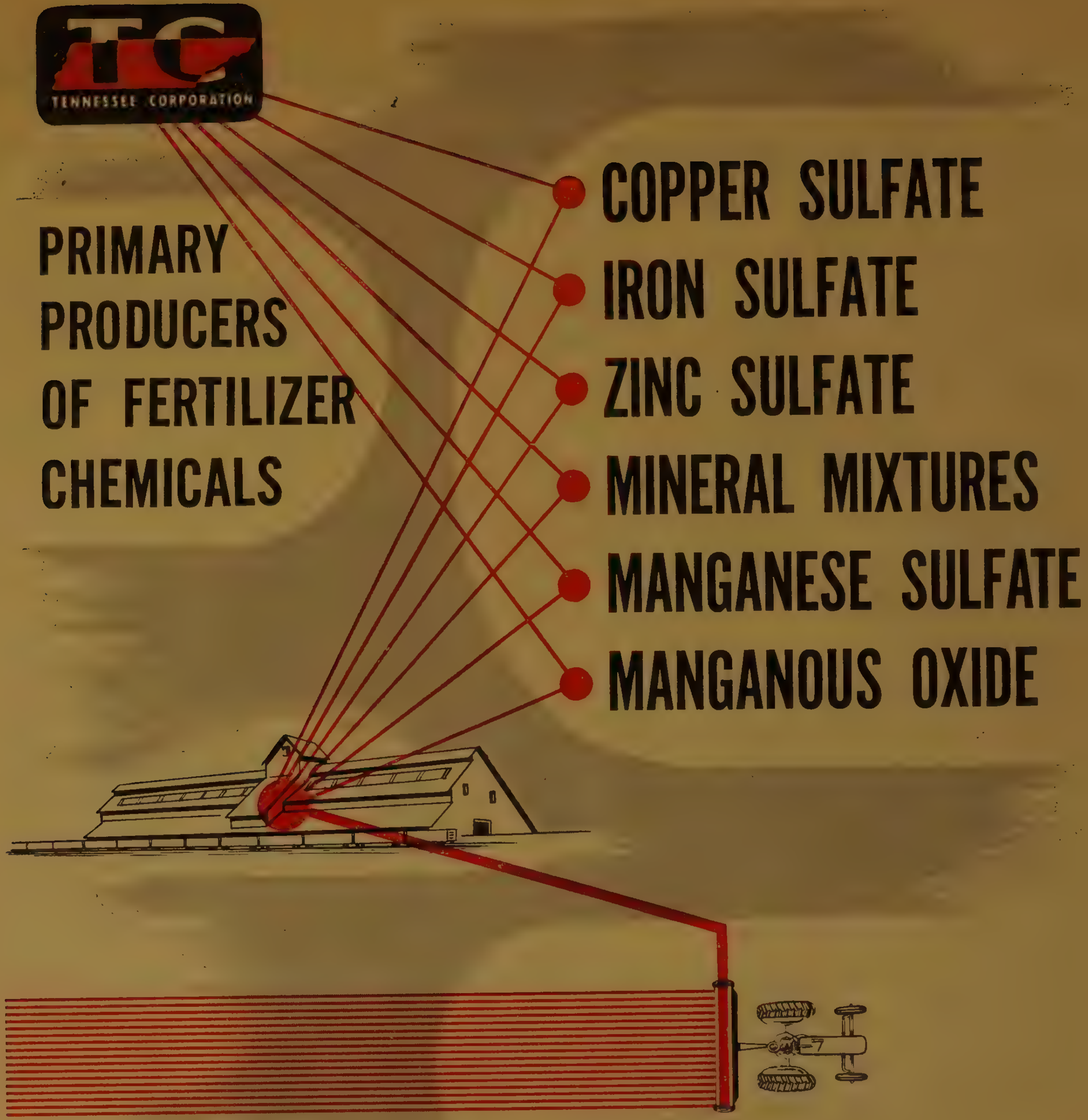

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Distillation 2F., ASTM	D-158	D-158	D-158	D-158	D-158	D-86	D-850
IBP, °F.	400	420	398	450	440	276	282
EP, °F.	494	520	525	534	705	—	—
DP, °F.	—	—	—	—	—	360	320
Specific Gravity, 60/60°F.	0.974	0.986	0.950	0.997	0.943	0.843	0.865
Aromatics, Vol. %	98	99	82	99	71	76	94
Mixed Aniline Point, °F.	55	54	75	54	100	84	59
Flash Point, COC., °F.	190	210	200	225	220	—	—
Flash Point, TCC., °F.	—	—	—	—	—	82	85
Solubility*							
DDT (tech.)	39	42	39	43	28	25	29
BHC (tech.)	29	34	41	31	43	23	28
Lindane	9	10	11	14	5	10	15
Dieldrin	26	28	26	27	25	26	29

*Wt. parts in 100 parts solution at 32° F.

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MEETING CALENDAR

Aug. 3-7—Gordon Research Conference on Biochemistry and Agriculture, Kimball Union Academy, Meridian, N. H.

Aug. 9-13—Rocky Mountain Conf. of Entomologists, Cameron Pass 4-H Club Camp, Gould, Colo.

Aug. 18-22—California Fertilizer Assoc., Bigwin Inn Lake, Bays, Ont.

Sept. 10 — New Pesticides Review, Sponsored by Western Agricultural Chemicals Assn., Fresno Fairgrounds, Fresno, Calif.

Sept. 20-24—Canadian Agricultural Chemical Assn., Chateau Frontenac, Quebec, Canada.

Sept. 24-25 — Annual Northeastern Fertilizer Conference, National Plant Food Institute, Biltmore Hotel, New York.

Sept. 30-Oct. 1—Southeastern Fertilizer Conference, Biltmore Hotel, Atlanta, Ga.

Oct. 13-14 — Western Agricultural Chemicals Assn., fall meeting, Villa Hotel, San Mateo, Calif.

Oct. 14-16—Pacific Northwest Plant Food Assn., annual convention, Chinook Hotel, Yakima, Wash.

Oct. 15-16—Chemical Control Conference and Fertilizer Control Officials Meeting, Shoreham Hotel, Washington, D. C.

Oct. 19-20—Fertilizer Safety Section, National Safety Conference, LaSalle Hotel, Chicago.

Oct. 21-23—National Agricultural Chemicals Association, 26th Annual Meeting, French Lick-Sheraton Hotel, French Lick, Indiana.

Oct. 27-29—Florida State Horticultural Society, Everglades Hotel, Miami, Fla.

Nov. 2-4—Canadian Manufacturers of Chemical Specialties, second annual meeting, Royal York Hotel, Toronto, Canada.

Nov. 4-6—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 8-10—National Fertilizer Solutions Assn., annual convention, Statler Hilton Hotel, St. Louis, Mo.

Nov. 9-11 — California Fertilizer Assn., 36th Annual Convention, Fairmont Hotel, San Francisco.

Nov. 12-15—Texas Aerial Applicators Association, annual convention, Orange House, Orange, Texas.

Nov. 16-20 — National Aviation Trades Assn., 20th Annual Convention, New Orleans, La.

Nov. 30-Dec. 3—Joint meeting of Entomological Society of Canada and Entomological Society of America, Detroit, Mich.

Nov. 30-Dec. 2 — Soil & Crop Science Soc. of Florida, Gainesville, Fla.

Dec. 7-9 — 46th annual meeting, Chemical Specialties Manufacturers Assn., Mayflower Hotel, Washington, D. C.

Dec. 7-10—Western Canadian and North Central Weed Control Conferences, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada.

Jan. 6-8—Northeastern Weed Control Conf., 14th annual meeting, Hotel New Yorker, New York.

Jan. 14-16 — California Agricultural Aircraft Association, 10th Annual Convention, El Mirador Hotel, Palm Springs, Calif.

Jan. 13-15 — Agricultural Ammonia Institute, 9th Annual Convention, Statler-Hilton Hotel, Dallas, Tex.

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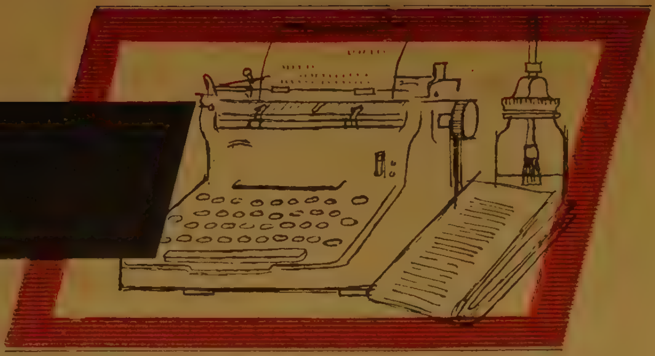
EDITORIALS



THE efforts of the insecticide industry to mount any appreciable public relations and educational program have been meager indeed, as we have pointed out periodically in these pages. One of the major failures has been the lack of any well organized effort by insecticide producers to make sure that users have the facts on how to use these occasionally two-edged tools, and specifically the failure of the manufacturing end of the industry to do its share toward helping train and educate aerial applicators. A few individual companies have done a good job on their own hook, but the industry as a whole has never come up with the funds to allow its trade association to attempt the over-all industry job which is actually needed.

In an article in this issue of *Agricultural Chemicals* (See Pg. 41) C. H. Hoffman of the Entomology Research Division, U.S.D.A., points out a specific example of such a need. He says: "There is a need for a manual to cover the many problems that arise in connection with any large-scale aerial spray program. A manual based on the best procedures developed through the years of experience would serve as a helpful guide for the conduct of effective and safe programs."

We agree wholeheartedly, and we could add the thought that preparation and distribution of such a manual could head off and eliminate in advance hundreds of possible future complaints and attacks on insecticides, their producers and applicators. The industry is necessarily dealing with a list of more or less toxic materials. Unless it takes every advance precaution,—and makes every effort—to forestall trouble which can accompany application of its products, it can never feel justifiably immune from criticism by the public.

We have heard some in the industry express the opinion that the pesticide manufacturer's job is simply to produce efficient pesticides, —and that application is some one else's responsibility. We are afraid, however, that this is an attitude that is somewhat out of date,—reminiscent of the days of calcium arsenate and Bordeaux mixture. It is about time that the pesticide industry got used to the idea that every misuse of its products, every error in application, will come right home to plague the manufacturer. And, since it is impossible for the manufacturer to divorce himself from the consequences of improper use of his products, he should be mighty sure that the applicator has every necessary bit of information to ensure that he will do the best possible job. It's high time, in our opinion, that funds be budgeted by NACA to make an effective educational program possible.

AS the growing season advances, the word still is that it is going to be a big year for sale of agricultural chemicals. Fertilizers are moving in heavily increased volume, and pesticide sales, too, are the best in several years. A heavy increase in demand for basic insecticides from the export market, incidentally, has removed excess stocks which had previously been hanging over the market, creating a climate which could support a firmer price structure.

One of the bright spots in the '59 market picture has been the tremendous demand for granulated pesticides, — both insecticides and herbicides, particularly from growers in the mid-west. Granular products offer a number of advantages to the user, and their use has been

(*Continued on Page 85*)

Laboratory tests verify pilot-plant nitrogen loss tests

Full length distributors reduce nitrogen loss

Use of NH_4NO_3 solutions not attractive in granulation of high nitrogen grades

No-nitrogen grades made by granulating superphosphates

BECAUSE of the economic advantage of utilizing low-cost ammonia to supply nitrogen in mixed fertilizers, TVA sudies for many years have been concerned with ammoniation of superphosphates. In the course of these investigations, TVA developed the continuous ammoniator-granulator, which was introduced at pilot plant demonstrations in 1953. Since then, the unit has been installed in well over 100 commercial fertilizer plants across the USA. The TVA pilot plant granulator is a 3′ x 3′ unit, operating at three tons per hour. Work has continued to further improve the ammoniator-granulator, most recently to solve the problem of heavy nitrogen loss which has been reported in several large-scale commercial installations of the TVA-designed unit, but which did not occur in the TVA plant.

At the June 9-11, 1959 demonstration, T. P. Hignett reviewed some of TVA's work on ammoniation and granulation, reporting that ammoniation rates consistent with good ammonia recovery, have been 3.8 and 5.8 pounds per unit, for triple and ordinary superphosphate, respectively. The rates, he observed, are somewhat lower than those used in earlier ammoniation tests, although the cause for this difference has not been established definitely.

Formulations and operating conditions have been found, Mr. Hignett reported, whereby fertilizers of all important plant food ratios could be granulated efficiently at low moisture content. This involved operating the ammoniator at fairly high temperature, usually 180° to 230° F. Granules formed at these temperatures were stronger than those formed at lower temperatures by addition of more water. When the reaction of superphosphate with ammonia did not supply enough heat to reach the desired temperature range, additional heat was supplied by steam or by reaction of ammonia with sulfuric or phosphoric acid.

The addition of sulfuric acid to fix more ammonia than can be absorbed by superphosphate is an economical means of producing the higher nitrogen grades. In the pilot plant, the first method tried for adding sulfuric acid was to spray it on the surface of the bed. This caused a considerable amount of fuming when the mixture contained muriate of potash, due to liberation of hydrochloric acid. Next, the acid was injected under the surface of the bed through a drilled pipe parallel to the ammonia sparger. When located in the discharge end of the ammoniator, it caused high ammonia loss. It was then moved to the midsection of the ammoniator. This location seemed satisfactory, and most of the development work was done with this arrangement. In some recent tests a full-length acid sparger was used rather than a short one. In some cases, the longer sparger gave better results, but usually there was not much difference.

In further tests, phosphoric or nitric acid was used in some formulations. Either acid could be added through the submerged sparger with good results. Spraying phosphoric acid on the surface of the bed also was satisfactory. Spraying nitric acid on the surface was not satisfactory because a large proportion of it was vaporized.

The Nitrogen Loss Problem

REPORTING on the nitrogen loss problem, A. B. Phillips, of TVA, theorized that a probable cause of heavy fuming and high nitrogen losses in large-scale commercial continuous ammoniators might be incorrect "scaling up" of TVA pilot plant data. Most equipment manufacturers assumed that the capacity of an ammoniator was proportional to its volume.

Elaborating on this theory, Mr. Phillips pointed out that a 6′ x 6′ ammoniator has eight times the volume of the TVA 3′ x 3′ pilot plant unit. Since the pilot plant operated satisfactorily at

(L. to R.): J. H. Walthal, director, division of Chemical Development; Charles H. Young, Manager of Chemical Engineering, TVA; A. R. Jones, director, TVA; Loren Johnson, Pittsburgh, and Clarence W. Wilson, Fairfield, Ala. both of U. S. Steel Corp conclusion of a 2-part review

* Report on the TVA Demonstration

three tons per hour, the 6 x 6′ unit was expected to handle 24 tons per hour. The reaction, however, occurs not throughout the entire volume of the ammoniator, but only in the immediate vicinity of the spargers. The length of the spargers of the 6′ x 6′ unit is about twice that of the pilot plant spargers, although they must deliver eight times as much ammonia and acid. Therefore, for each foot of sparger length, four times as much chemical reaction occurs. This can cause local overheating, overgranulation, mud formation, and attendant fuming and nitrogen loss.

Heavy nitrogen loss is an economic loss in several ways, remarked Mr. Phillips: (1) the actual value of the nitrogen lost, (2) the shrinkage in weight of the product, (3) the overage in P_2O_5 and K_2O for which the manufacturer does not get credit, and (4) the penalties and unfavorable publicity due to deficiencies found by state laboratories. These economic losses have been estimated to amount to several million dollars per year.

As a result of the increasing number of reports of failure in commercial units to make grade with respect to nitrogen, it seemed obvious to TVA investigators that losses not detected in the pilot plant work were involved. Thus studies of the past two years were designed to obtain further information on the nitrogen loss problem. Data was obtained on (1) the effect of acid feed rate; (2) effect of production rate per unit length of distributor; (3) losses due to decomposition of ammonium nitrate. Studies were made on 12-12-12 grade fertilizer, because it is the one in which highest nitrogen losses are reported.

It was found that in large units, ammonia loss will be increased by increased rates at some level of acid addition; and that losses increase with increased production rates per foot of distributor. Nitrogen is lost from the continuous ammoniator, both as free ammonia and in the form of decomposition products of ammonium nitrate. The decomposition products contain nitrous oxide, and possibly elemental nitrogen, and cannot be detected by ordinary gas analysis.

Concluding his review of the nitrogen loss investigations, Mr. Phillips said, "We believe that conditions favoring serious loss of nitrogen by decomposition of ammonium nitrate are likely to occur in many large-scale ammoniators. Localized areas of high temperatures or high acidity, or both, may result when distribution and mixing of the liquids with the solids are poor or when too much reaction occurs per unit length of distributor. These conditions may not be detectable by measurements made on the ammoniator product. Temperature near the distributors in the pilot-plant ammoniator during production of 12-12-12 has been found to be as high as 260° F., about 30° F. higher than the product temperature. It seems safe to assume that higher localized temperatures are encountered in large-scale units where there is less surface available for heat loss and good distribution is difficult to maintain.

"In order to reduce the loss of nitrogen caused by decomposition of ammonium nitrate when making high-nitrogen grades such as 12-12-12, we suggest the following precautions:

1. Use distributors that extend throughout the full length of the ammoniator.
2. Use distributors designed to give maximum distribution of liquids. Distributors should be slotted or should contain a large number of small holes rather than a few large ones.
3. Distributor and supporting members should be of streamlined design to minimize interference with the rolling action of the bed.
4. Formulations and operating conditions should be adjusted to avoid overgranulation to the extent that mixing would be impaired.
5. Distributors should be inspected and cleaned frequently. They should be

placed before the openings are enlarged to the extent that the distribution pattern is changed.

Laboratory Tests on N Loss

AMONG the visitors at the TVA demonstrations, was E. D. Shaw, of the Biochemical Department, Purdue University, Lafayette, Ind. Mr. Shaw has been conducting a series of studies on a laboratory scale on sources of nitrogen loss. He commented on his investigations at the meeting, pointing out that his tests were made, using chemically pure materials, that the studies were strictly of a laboratory nature,—but that some of the findings offer possible explanations for plant losses of nitrogen.

At one point, he observed, it was thought that the major nitrogen loss occurred during storage,—but this proved not to be the case. Investigating nitrogen losses due to heating, Mr. Shaw offered the following data, mentioning that nitrogen losses increased as the temperature itself increased. The rough sketch (figure 1) indicates the magnitude and rate of loss as the temperature increases.

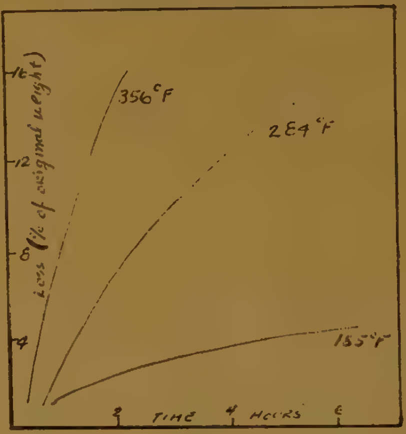


Figure 1

Mr. Shaw observed that a loss of ammoniacal nitrogen occurred whenever there was a loss of nitrate.

The chemical analysis of the mixture used in the above test was as follows:

	Formula "A" (grams)
NH_4NO_3	12.44
NH_4Cl	29.48
$(NH_4)_2SO_4$	—
$NaNO_3$	—
$Ca(H_2PO_4)\ 2H_2O$	21.30
$Ca_3(PO_4)_2$	—
K Cl	19.04
K_2SO_4	—
Na Cl	—
Ground sand	17.74

Sample heated 16 hours at 257°F.

	Total Weight of Nutrients in Sample (Grams) Before Heating	After Heating	Loss
Nitrogen (total)	20.34	16.26	4.09
Nitrogen-ammoniacal	16.38	14.58	1.80
Nitrogen-nitrate	3.92	1.8	2.12
Phosphoric acid	21.2	21.16	—
Potash	20.02	20.21	—
Chloride	47.49	45.18	2.31

The loss in weight on heating the above mixture for 18 hours at 260° F. was 14.8 per cent. Mr. Shaw added to his review of tests on moisture loss, reporting a series of investigations designed to study the influence of specific elements, Cl^-, H^+, etc. The following data on loss of moisture was reported for formulations essentially the same as formula "A", but which eliminated the elements indicated:

	% Loss
Formula B (no Cl^-)	1.66
Formula C (no H^+)	.53
Formula D (no NO_3^-)	2.63
Formula E (no NH_4^+)	1.63
Formula F (no NH_4NO_3	14.4

Studies reported by Mr. Shaw gave some indication that nitrogen might be lost as nitrous oxide, and as elemental nitrogen. He advised that, theoretically, some of the following reactions could be taking place:

$$NH_4NO_3 \xrightarrow{\triangle} N_2O + 2H_2O$$

$$NH_4NO_3 \xrightarrow[\ ]{H^+y\ Cl^-\ \triangle} NH_3 + HNO_4$$

$$5NH_3 + 3HNO_3 \rightarrow 4N_2 + 9H_2O$$

Summarizing some of his findings, Mr. Shaw reported that conditions required for nitrogen loss include the presence of:

acidity
NO_3^- ion
Cl^- ion
NH_4^+ion

Some possible means of offsetting nitrogen losses in ammonia-

(*Continued on Page* 87)

H. Manis succeeds L. H. Smith as Chairman of Pacific ESA at annual meeting in Sacramento

WESTERN entomologists and colleagues from other parts of the United States, Canada, and Hawaii, met June 23, 24 and 25 at the El Dorado Hotel in Sacramento, California, for the 43rd annual meeting of the Pacific Branch, Entomological Society of America. Approximately 311 persons registered for the 3-day sessions, which brought together workers in entomology from state, federal and industrial research groups, as well as others interested in the commercial and industrial phases of Entomology.

Officials for the 1958-59 period, and the annual meeting, were: chairman, Dr. Leslie M. Smith, University of California, Davis; vice-chairman, Dr. H. C. Manis, University of Idaho, Moscow; and secretary-treasurer, Dr. H. H. Keifer, California Department of Agriculture, Sacramento.

Heptachlor and Alfalfa Hay

In the Imperial Valley of Southern California, an application of 2.4 oz. of actual heptachlor per acre has given good control of larvae of Egyptian alfalfa weevil and alfalfa weevil, with little effect on the four species of predators which aid in their suppression, Vernon M. Stern, University of California, Riverside, reported. This same situation has been found to hold true in restricted areas of the central San Joaquin Valley.

Dibrom and Vegetable Crop Insects

Dibrom, a non-systemic, nonresidual brominated DDVP, was tested against aphids and certain lepidopterous larvae on broccoli, spinach, and lettuce in the Pacific Northwest. Information presented by C. R. Tanner, California Spray-Chemical Corporation, Portland, Oregon, indicated this material seems to be very promising for use on crops where a short residual action, and elimination of residues on crops at harvest are desired. The breakdown of dibrom is very rapid within 24 hours. Mammalian oral toxicity is approximately one-fourth that of DDVP. Control of susceptible forms was good, where these were in exposed locations on the crops tested. The chemical has a contact action. When used on thick stands of peas, two to three feet high, little penetration or control of pea aphids was secured.

Granular Systemics on Sugar Beets

Aphids, spider mites and leafhoppers—principal pests of sugar beets in the Imperial Valley of California, are difficult to control with conventional chemical applications, due to the large size of these plants when insect infestation occurs. Dr. H. T. Reynolds, University of California, Riverside, indicated that in experimental tests, quantities of granular systemic insecticides, including thimet, disyston, and thiodan were released from a height of two to three feet over the plants to control these pests. The granules funneled down into the plant crowns, with a certain amount remaining on the leaves. A three-way control was secured—contact, systemic, and fumigation; with the fumigation action being the most pronounced. In the case of thimet, increases in sugar production treated blocks averaged 10% more than checks, with a three to four ton increase of beets per acre. A check of the nitrogen and phosphorus content of leaves indicated treated beets were able to use plant food elements more effectively than non-treated ones.

Efficiency of Granular Insecticides

"Granular formulations of insecticides were first used in 1949 to control mosquitoes — after the failure of spray and dust formulations to do this job," Dr. M. S. Mulla, Citrus Experimental Station, Riverside, Calif., told the group. Granules penetrated into the water and controlled aquatic forms of mosquitoes which did not require surfacing to obtain oxygen. Granular formulations for control of sand fly and salt marsh mosquitoes frequently gave good results where foliage penetration was needed, and with less residues on treated areas from use of granular formulations, there was greater safety to beneficial insects.

While field and laboratory work on granules for these uses showed good results, little practical work has been done, Mr. Mulla stated. Granular formulations are a complex system—consisting of carrier, solvent, and impregnation by the toxicant—all factors influencing final performance of the insecticide granule. The goal of Mullas' studies was to find the basic factors influencing the efficiency of granular formulations. It was discovered that one reason for the wide range in efficiency in formulations was due to the solvent factor. Of the more than 500 to 600 solvents which might be so used, some 60 were tested. The granule used for test purposes was an AA LVM 30/60 Attapulgite material. Where heavy agromatic solvents were used, a slow release of toxicant followed; while with certain others, there was a rather rapid release—in some cases within 24 hours. The efficiency of toxicant release depended upon flash point, distillation range and boiling point of solvent used.

Salt Marsh Caterpillar—Arizona

"Toxaphene-DDT mixtures gave effective control of salt marsh caterpillar at Yuma in 1955. Field studies undertaken in 1958 indicated this same mixture was not giving commercial control. Dilan, dylox, sevin, parathion, and mixtures of endrin plus methyl parathion gave commercial control," stated Dr. George P. Wene of the University of Arizona, Tuscon.

DDT and Codling Moth Resistance

Dr. H. F. Madsen, University of California, Berkeley, reported that field evidence indicates the codling moth is developing a tolerance to DDT in certain California orchards. This suspected tolerance is restricted to individual orchards in widely separated areas. Guthion and sevin, when used in place of DDT in these orchards, have given adequate control.

Grape Leaf Folder

Tests of dust and spray applications of sevin, and spray applications of endrin or standard leaf arsenate against first brood grape leaf folder larvae were discussed by Dr. E. M. Stafford, University of California, Davis. These applications were very effective, with control lasting through the second brood. In other tests, sevin and parathion dusts were also effective against second and third brood larvae. It was noted that the effectiveness of sevin sprays was lowered by use of a casein — lime spreader.

Delnav and Surfactants

"The effectiveness of delnav applied in low volume sprays for the control of mites on cotton was greatly increased by the inclusion of a surfactant," Marvin H. Frost, Jr., Hercules Powder Company, Fresno, California, stated. Field trials on cotton and laboratory tests on beans showed that the surfactant increased the rate of

(*Continued on Page* 102)

Sales Trends Discussed At Illinois Fertilizer Conference

NEARLY 150 fertilizer manufacturers, sales representatives, trade association staff members, and agronomists gathered at the annual Fertilizer Conference at the University of Illinois, June 29-30.

At the opening session, Dr. George Stanford, chief of the Soils and Fertilizer Research Branch of Tennessee Valley Authority, discussed "Frontiers in Fertilizer Research." He reported that opportunities existed for using more super phosphoric acid in formulating higher analysis liquid fertilizers. Their research has shown that by concentration of wet process acids they can produce super phosphoric acid. Another process with possibilities in fertilizer manufacture involves the conversion of muriate of potash to potassium hydroxide—thus enabling a manufacturer to produce more different analyses of liquid fertilizers.

Dr. Stanford pointed out that although potassium hydroxide is currently expensive, with larger production, lower costs may be possible. With the new process that could be adopted, higher analysis liquid fertilizers could be produced in the future.

Dr. Stanford reported on the area of new types of carriers for nitrogen, phosphorus, and potassium. Research workers are trying to find a compound that is relatively low in water solubility that will vary in availability with particle size. Ideally the carrier would be slowly available during the early growth of the plant and become more rapidly available during the period of rapid growth.

Other advantages of this type of carrier would be fall application with assurance of less loss. These processes are now possible, but they are yet to be achieved on an economical scale of production. Dr. Stanford reported that fused potassium phosphates with low potassium solubility may become important sooner. The possibility of a low soluble single potassium source is very remote, he concluded.

L. T. Kurtz, professor of soil fertility, reported on trends in fertilizers sold in Illinois. He pointed out that during the past 20 years, Illinois has developed from a minor position in fertilizer use to the fourth ranking state in total nitrogen, available phosphate, and potash. When the phosphate in rock phosphate is added, Illinois ranks first in total plant food nutrients. The total amount of fertilizers sold in Illinois in 1958 added up to 1,442,883 tons. This consisted of 544,592 tons of mixed fertilizers, 387,005 tons of fertilizer materials, 510,002 tons of rock phosphate, and 1,284 tons of colloidal phosphate.

Over the past four years the rate of increase in soluble fertilizer nutrients in materials used has been greater than in mixed fertilizers. The percent of nutrients sold in mixed form has dropped from 75 per cent in 1950 to 62 per cent in 1955 and 56 per cent in 1958. The most popular ratio of mixed fertilizer is 1-4-4, next is 1-1-1. The 1-4-2 ratio is replacing part of the 1-4-4.

Samuel R. Aldrich, professor of soils extension, reported that Illinois has 80 county soil testing laboratories and 44 independent laboratories. Together they test from 500,000 to 660,000 samples each year. These samples represent about two million acres —

(*Continued on Page* 102)

AMMONIATING SOLUTIONS

—factors to be considered in selecting the correct solution for fertilizer manufacture

by Grant C. Marburger*
Spencer Chemical Co.
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CONFUSION in ammoniating solutions is so common in the fertilizer industry today, and yet they are so simple. The real meaning of this paradox is not appreciated until it is translated into dollars. Like oil and water, which will not mix together, good economics and wrongly used solutions can never sit side by side in anybody's plant. One to four dollars a ton for 10,000 tons production represents a figure that many of us in the fertilizer industry would trade for our salaries. There are cases where this amounts to more than $100,000 for a single company, but let's first get into some basic principles.

Nitrogen solutions in general are made up of free ammonia, ammonium nitrate, urea and water. The free neutralizing ammonia is the constituent that reacts chemically in all fertilizer production, combining with superphosphates or phosphoric acid. The ammonium nitrate or urea constituents can be classified as fixed nitrogen. They are non-volatile or stable compounds at ordinary temperatures. The amount of solution that can be used in the production of a grade of fertilizer is limited by the capacity of the superphosphates or phosphoric acid to react with the free ammonia in the solution. or saying it another way, the free ammonia content of the solution determines the amount that can be used. The balance of the nitrogen is usually made up from sulphate of ammonia, a high cost material, or additional solution is used and sulphuric acid is added to combine with the excess free ammonia, forming sulphate of ammonia in the mixer.

Based on these basic facts of chemistry, the one most important characteristic in choosing a nitrogen solution is its free ammonia content, and this property becomes the first basis to use when selecting a solution. It must be expressed in some way as a ratio of free to fixed nitrogen in order to become usable in comparing one solution against another. An easy way of expressing this can be made in terms of ammoniation rate. This is best shown in a chart. Figure #1 illustrates the solution nomenclature system used throughout this discussion.

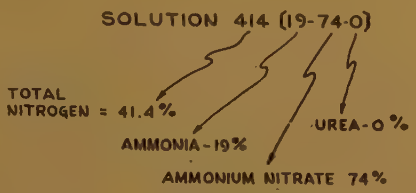

Figure 1

Solutions are named using the nomenclaure system adopted by the industry in September of this year through the efforts of the National Plant Food Institute. For those of you new to this nomenclature, the first number gives the total nitrogen content of the solution with the decimal point omitted. The figures inside the brackets give the percentage content of ammonia, ammonium nitrate and urea in the solution to the nearest whole number, in that sequence. For example, Solution 414 (19-74-0) has a total nitrogen content of 41.4 percent. This nitrogen is derived from a combination of 19 per cent ammonia, 74 percent ammonium nitrate and 0 percent urea.

Figure 2 shows a table of ammoniation rates which has been compiled as an aid in choosing a nitrogen solution with the proper free to fixed nitrogen ratio for the grade to be manufactured. Its sole purpose is to provide a birdseye view of the free ammonia content comparison between different solutions. If a 1-1 ratio fertilizer is to be produced, it can be seen from the figure that Solution 414 (19-74-0) would give a 9.2 degree of am-

Figure 2

Fertilizer Ratio	Ammoniation Rate*						
	Spensol 414 [19-74-0]	Spensol 440 [22-66-6]	Spensol 448 [25-69-0]	Spensol 471 [30-64-0]	Spensol 490 [34-60-0]	Spensol 506 [43-45-0]	Spensol 530 [49-36-0]
1-1	9.2	10.0	11.2	12.8	13.9	16.8	18.5
1-2	4.6	5.0	5.6	6.4	7.0	8.4	9.3
1-3	3.0	3.3	3.7	4.3	4.6	5.6	6.2
1-4	2.3	2.5	2.8	3.2	3.5	4.2	4.6

* All units nitrogen from Spensol

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*Report presented at the Fertilizer Industry Round Table, Washington, D. C., November, 1958.

moniation, if all units were obtained from solution, whereas Solution 530 (49-36-0) would yield 18.5. The choice would be the solution closest to the ammoniation rate that can be achieved, generally 4 to 5 percent, consequently Solution 414 (19-74-0), yielding 9.2 degree of ammoniation would be chosen. On the other hand, if a 1-4 ratio is to be produced, the first solution would allow an ammoniation rate of 2.3 and the latter 4.6. The latter would be chosen, since it is closer to a 5 degree ammoniation rate, unless additional factors yet to be considered in the selection of solution should rule it out.

Figure 3

Solution	Free N ÷ Total N %
318[8-72-0]	20.6%
414[19-74-0]	37.8%
440[22-66-6]	41.1%
448[25-69-0]	45.9%
471[30-64-0]	52.4%
490[34-60-0]	57.1%
506[43-45-0]	69.3%
530[49-36-0]	76.0%

Another excellent way of comparing the free nitrogen content of solutions is illustrated in figure 3. First, notice the column at the left. The free nitrogen ratio can be observed from the name alone by mentally comparing the ammonia content and the ammonium nitrate content. In the case of urea containing solutions, the urea must be added to the ammonium nitrate content, and this total compared to ammonia. The column at the right is a tabulation where this ratio has been calculated. The free ammonia nitrogen is expressed as a percent of total nitrogen. The larger this number becomes, the higher the free ammonia content of the solution. A graphical presentation shows this principle more clearly (figure 4). The graph shows the nitrogen derived from ammonia in white and the fixed nitrogen in black. Anhydrous ammonia is listed to show at a glance how the various solutions relate to anhydrous which, of course, contains only ammonia nitrogen.

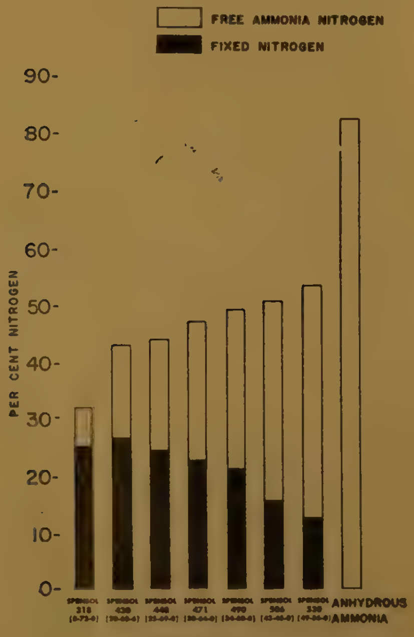

Figure 4

Figure 5
12-12-12

Spensol 440 (22-66-6)	386	@ .0287	$11.08
Sulfate Ammonia	339	.0205	6.96
H_2SO_4	115	.0135	1.55
Potash	400	—0—	—0—
Triple	306	.029	8.87
Normal	497	.009	4.47
	2043		$32.93
Spensol 490 (34-60-0)	303	.0334	$10.12
Sulfate Ammonia	444	.0205	9.10
H_2SO_4	173	.0135	2.34
Potash	400	—0—	—0—
Triple	393	.029	11.40
Normal	300	.009	2.70
	2013		$35.66
Spensol 440 (22-66-6)	546	.0287	$15.67
H_2SO_4	223	.0135	3.01
Potash	400	—0—	—0—
Triple	213	.029	6.18
Normal	712	.009	6.41
	2094		$31.27
Spensol 490 (34-60-0)	490	.0334	$16.37
H_2SO_4	366	.0135	4.94
Potash	400	—0—	—0—
Triple	283	.029	8.21
Normal	553	.099	4.98
	2092		$34.50

If the plant superintendent wants a high free ammonia solution for a given need, say a 1-4 or 1-3 ratio, he would select a solution with a high percentage free to total nitrogen. For a 1-1 or 1-2 ratio, where a high percentage of fixed nitrogen is desired, he would select a low number, after taking into consideration salting out temperature.

In this ratio method of comparing solutions, it is to be noted from the physical properties listed in the tables that as the percent of free to total nitrogen gets larger, the salting out temperature decreases and the vapor pressure increases. Some new developments in solutions whereby the salting out temperature is decreased, voids this general rule.

The selection of a solution based on the free nitrogen content principle becomes important from an economic standpoint. The next few (figures 5, 6, 7) illustrate the effect that the correct solution choice can have on reducing formula costs. Formulas illustrating grades 12-12-12 and 5-20-20 have been used, as most other ratios will fall between these two.

If 12-12-12 is to be produced with a high free ammonia solution, the formula cost increases because more sulphuric acid is required and more triple superphosphate must be used. Since sulphuric acid is not a plant food, its cost is an added expense, and the formula cost rises as triple is increased, since it is more expensive than normal superphosphate. The actual spread in cost depends entirely on delivered raw material prices at a given location and cannot be guessed in advance. Only a comparison of the complete formulas will evaluate the economics under consideration.

For a plant equipped to use anhydrous ammonia, the choice of solution is simple. That with the lowest free ammonia content would be chosen, if facilities are present to prevent salting out. When such facilities are not available, the lowest free ammonia solution with a tolerable salting out temperature is the proper one.

With anhydrous ammonia available to the plant, only one solution is needed for all grades manufactured. By the addition of ammonia, you are in effect making your own solution in situ. Using a combination of anhydrous ammonia and the lowest free ammonia solution that can be used without salting out problems for the climate involved, gives maximum flexibility by enabling the plant superintendent to tailor-make the right combination for any and all of the grades he produces. Plants so equipped eliminate the necessity to handle several solutions. The handling and use of anhydrous ammonia presents some problems, but it is being used successfully at many plants. Anhydrous is a concentrated nitrogen material and a small error in measuring shows up in the product analysis. Being a gas at ordinary pressure and temperature makes it harder to hold in the reactor. In other words, more exacting conditions are required to prevent ammonia loss. There is considerably more advantage to using anhydrous ammonia in a continuous ammoniating system than in a batch operation. Losses in handling and metering are also considerably less.

Once the proper solution has been selected on an ammoniation rate basis, other principles must be considered before making a final selection. The fundamentals are simple, and can be properly evaluated if all presently known technology is utilized in making their choice.

The salting out temperature, of course, must be appropriate. Low free ammonia solutions, such as those used in making 2-1 and 1-1 ratios are involved with this problem. Ammonia is a solvent for ammonium nitrate and/or urea, so low free ammonia means high salting out temperatures. High free ammonia means high vapor pressure and should not be used unless the equipment is adequate.

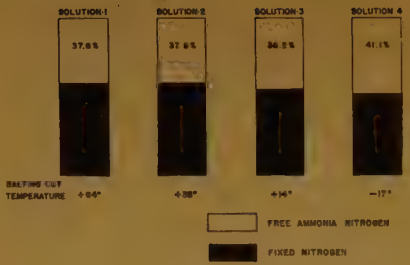

Figure 8

Recent solution changes have greatly improved the salting out problems formerly encountered with low free ammonia solutions. The addition of urea in small quantities, forming proper combinations with ammonium nitrate, will reduce salting out temperatures. Notice (figure 8) the drop in salting out temperature from 64° to 35° between the first two solutions, both having 37.8 percent free nitrogen, and the same total nitrogen content. Or the last solution which has a small increase in free nitrogen, 37.8% to 41.1%, and yet drops the salting out temperature from 64° to −17°. Six percent urea is the additive that has depressed this temperature, which is the reason for its presence, yet the amount of urea is not sufficient to cause the fertilizer to be more hygroscopic.

The physical condition of the fertilizer must be considered in se-

Figure 6

5-20-20

Spensol 440 (22-66-6)	107	@ .0495	$3.22	
Anhy. Ammonia	65	.0287	3.07	
Potash	667	—0—	—0—	
Triple	614	.029	17.80	
Normal	593	.009	5.34	
Steam	135	.001	.13	
	2181		$29.56	
Spensol 506 (43-45-0)	198		$ 6.80	
Potash	667		—0—	
Triple	617		17.90	
Normal	580		5.21	
Steam	135		.13	
	2197		$30.04	(+$.48)

5-20-20

Anhy. Ammonia	122	$ 6.04	
H_2SO_4	135	1.83	
Potash	667	—0—	
Triple	676	19.60	
Normal	441	3.97	
	2041	$31.44	(+1.88)

Figure 7

5-20-20

Spensol 506 (43-45-0)	198	$6.80	
H_2SO_4	135	1.28	
Potash	667	0	
Triple	724	21.00	
Super	337	3.20	
	2061	$32.28	($2.72)

5-20-20

Anhy. Ammonia	122	$6.05	
Potash	667	0	
H_3PO_4	390	15.60	
Normal	950	8.55	
	2129	$30.20	(+$.64)
Spensol 506 (43-45-0)	198	$6.80	
Potash	667	0	
H_3PO_4	140	5.60	
Triple	448	13.00	
Normal	685	6.15	
	2138	$31.55	(+$1.99)

lecting a nitrogen solution, and the amount of ammonium nitrate and urea may or may not cause the fertilizer to have poor physical properties. There is little standardization in the fertilizer industry insofar as process equipment and operating conditions are concerned. Knowing just how far to go on the use of ammonium nitrate and/or urea is a matter of judgment, and the knowledge of the individual plant's set-up is the only possible way to exercise good judgment. In granulation, many plants have dryers without sufficient capacity to dry to a low enough moisture at the production rate they wish to run. To produce a product that is free from bag cake, the amount of ammonium nitrate and/or urea that can be tolerated is governed by the moisture content of the finished product.

The water content of the solution is important. In granulation the use of "dehydrated" solutions on high nitrogen grades is automatically recommended. The low water solutions reduce the excess liquid phase encountered in these grades, which in turn will serve either to reduce recycle, if it is used for control, or to reduce the amount of sulphate of ammonia used in the formula. These solutions offer the additional advantage of freight savings because of their greater concentration. Non granular fertilizers, produced in plants without mechanical dryers, are critically dependent upon the moisture content of the finished product. Since most of the moisture introduced in their production comes from superphosphate and ammoniating solutions, the water content of the solution becomes important.

In recent years, the choice between urea and ammonium nitrate solutions, or combinations thereof, has become important in manufacturing non-granular fertilizers. The only purpose of the urea in the solution is to change the crystal habits of ammonium chloride and potassium nitrate in the finished product, to reduce bag set or bag cake. On the other hand, the presence of urea in combination with ammonium nitrate makes a more hygroscopic mixture than either ammonium nitrate or urea alone. Also, the urea will decompose in storage if the fertilizer is allowed to go to the pile too hot. Urea decomposes at temperatures above 120°F, and releases free ammonia. The ammonia reacts with the phosphates, causing reversion, and the beneficial effect of urea to reduce caking in non granular fertilizer is lost. Straight urea solutions do not form objectionable salt crystals, but their high water content, plus the hazard of urea decomposition in storage, restricts the effectiveness of these solutions.

Despite the high pressure equipment involved in their use, high ammonia solutions can satisfactorily produce good mechanical condition in non granular fertilizers. Sufficient heat is created by the free ammonia to lower the moisture content to a safe level, and a reduction in hygroscopic salt content is obtained.

In general, the selection of solutions for non-granular production is more difficult than granular. Operating conditions vary more from plant to plant and the curing factor is brought into play. The mixer temperature has a great bearing on the physical condition of the finished product. The retention time in the mixer, amount of ammonium sulphate used, storage temperature, size of storage pile and numerous other things affect the quality of the product. Product moisture content and curing time are the two factors more important than selection of the proper solution, or the formula used.

Very little mention of economics has been made in this discussion, yet the principles described are all aimed in the direction of obtaining savings through the correct choice of ammoniating solutions.

No discussion on this subject would be complete without including the question so frequently asked, with great justification: Are so many solutions necessary? The answer: No. Progress in the development of fertilizer technology has been gradual, just as the engineering developments in automobile manufacture. The auto industry comes out with new models each year in which they combine the good features of the old with new and better features. New solutions have been added to meet the needs of new technology in formulating and processing. When the new technology has been completely adopted, some of the old solutions can be dropped from the list. Just as the auto industry has to continue making parts for old vintage cars, the nitrogen industry will continue making solutions until manufacuring plants are altered to the latest technology.

This point is illustrated in figure 9. In this figure we are looking at most of the solutions produced by our company. We are also looking at them on the basis of physical properties, which have been graphically expressed for easy

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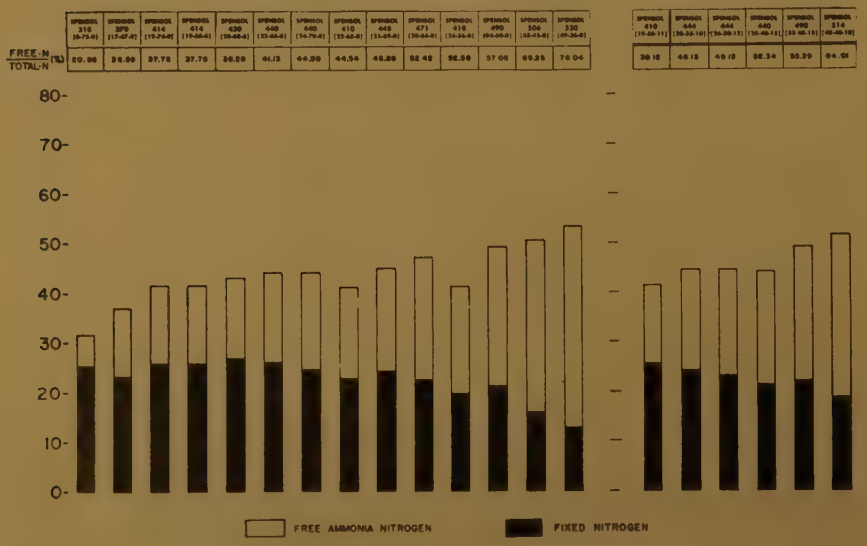

Figure 9

Insecticides for Pest Control vs Hazards to Aquatic Life

Public Relations
Conclusion of 3-Part Report

By C. H. Hoffman
Entomology Research Division
U. S. Department of Agriculture
Agricultural Research Service

SINCE many insecticides are required to control insects that destroy crops, livestock, and man, a great responsibility rests on those developing new materials and recommending them for use. The public needs to be better informed on the many legal requirements that must be met before a new material can be registered by the U. S. Department of Agriculture for use to control pests and to permit interstate shipments. How many people know about Public Law 518, an amendment to the Food, Drug, and Cosmetic Act, which prescribes for the establishment of tolerances or exemptions from tolerances for pesticides to assure the consumer of food free from harmful residues?

There also seems to be a real need to advise the public on large control programs well in advance, so that they will understand the aims, nature of operations, benefits, and hazards. There should be close cooperation and trust between officials of different agencies, so that all interests will be adequately protected, with special consideration where there are areas of conflict. There are numerous examples in years past of apparent conflicts in connection with control programs, which, after a full exchange of views or cooperative studies resulted in programs that were mutually advantageous and of great benefit to the public.

Seldom are objectors to the use of insecticides farmers or producers, who require these materials in making a livelihood. They may well be hundreds of miles from the scene of operations and lack data to substantiate their claims. Too often unexplained fish kills, small or inconsequential in relation to the total population in the lake or stream, make the headlines, and if there is no readily explained cause, they will be attributed to the use of insecticides if there was any spraying near the area. It is the release of nonfactual information that is giving insecticides a bad name. Even spokesmen for wildlife organizations appear to be ill advised on current control programs, and also on findings from toxicological studies of DDT in relation to human health and to fish and wildlife. The use of such information by individuals and organizations is not likely to cement relations between those responsible for insect-control programs and wildlife groups. Of course there is always resort to the courts, such as the DDT-gypsy moth trial last year. This was a time-consuming and expensive trial of doubtful value. The direct and indirect costs would have supported some substantial field investigations to determine the effects of insecticides on aquatic life.

As scientists, we have not been telling the public enough about our research. Important discoveries are made each year, and they are in due time recorded in scientific journals. However, they also should be brought to the attention of the public through popular media. Perhaps a better appreciation of our research programs, and their application to practical control problems—such as the eradication of the Mediterranean fruit fly from Florida, the apparent eradication of the screw-worm from the Southeast, the efficient control of mosquitoes in many parts of the country, the economic control of devastating forest insects, and the control of hundreds of injurious insects on crops—would lead to better support for research, particularly in areas where there are joint interests, including effects of insecticides on aquatic life. Some of these programs might be of great value in wildlife conservation. The elimination of the screw-worm from the Southeast, for example, will certainly result in an increase in deer and other game.

Present and Future Research

THE Entomology Research Division recognizes the benefits and limitations of many control methods and is striving to solve the most urgent problems with available resources. In recognition of the importance of reducing hazards, emphasis is being placed on safer chemicals and on methods of using them with maximum safety. Research on biological agents is being stressed where this type of control appears useful, either alone or in combination with insecticides. Additional crop varieties resistant to insect attack need to be developed. Basic studies are being initiated on the possible use of selective chemicals, such as, hormones and growth inhibiting substances. New ways will be sought to use insecticides, as in baits with attractants, in order to lessen the amount of toxicant required. Advancements are being made in the development of systemic materials that are specific against certain pests, and of new formulations and materials that are effective against pests but less toxic to other animals. A unique new approach in insect control involves the continued release of males sterilized by gamma rays from a cobalt-60 source to destroy the reproductive potential of natural populations of the screw-worm fly. This technique, which leaves no residues or other undesirable effects, may be useful in the control of other insects, but extensive research will be required to make such determinations.

With the expanding use of insecticides there is a marked need for broad cooperative studies between entomologists, fishery biologists, and chemists to determine the direct and long-term effects on aquatic life of insecticides in current use, and those expected to be used in future control programs. It is evident from a review of recent literature that there have been no detailed studies on effects of insecticides on fish-food organisms except for DDT. There have been some excellent laboratory studies evaluating the comparative toxicity of new materials to fish, but the real test comes in evaluating them under field conditions when many variables are operative, such as (1) ecological difference in ponds, lakes, and streams, (2) a great variety and abundance of aquatic insects with different habits, (3) variation in fish populations and their susceptibility to poisoning, (4) variation in shore line or tree canopy, (5) proximity to untreated water to furnish immigrants for repopulation, and (6) influences of weather on the application and distribution of the insecticide.

In field experiments there must be suitable controls and pretreatment samples. Certain chemical control treatments may greatly reduce aquatic organisms. However, natural phenomena, such as flash floods, can cause catastrophic losses of bottom organisms. There is need for basic studies to determine the relationship between the abundance of bottom organisms and fish populations. Past studies indicate that fish have food preferences and also that they are opportunists. Thus, a considerable but temporary loss of bottom organisms may be of little importance. Following spraying, fish will feed on terrestrial insects falling on the water and on those bottom organisms available, which might not be utilized normally, but which survived the spray. On the other hand, certain treatments might cause heavy losses of aquatic fish foods, which would be replaced very slowly and thus affect the condition of the fish.

Studies are needed to determine exactly what happens when a lake or stream receives an insecticide spray. How much insecticide reaches the water, and how long can it be detected in water samples? Does it settle out into the mud or on bottom vegetation, or is it blown to the shore in an oil film? If absorbed on mud or vegetation, is it available to poison small animal life or fishes? Are fishes killed from direct contact with the spray or from feeding on spray-killed insects, or both? Why do some fishes gorge on treated insects in sprayed areas and survive, whereas others die? Are these effects merely transient, or can important fish losses occur long after spraying because of insecticide accumulation in the stream? I am convinced that water turbidity and high organic content can nullify the effect of DDT on fish. A careful study of this matter might lead to ways of introducing a material into a stream, or artificially muddying the water for a brief time during the spray operation to curtail the toxic effects of the insecticide on fish.

Literature covers instances in which fish losses occurred following run-off of insecticides from treated fields, especially cotton, into creeks and rivers. Unfortunately these rivers were not sampled for bottom organisms and fish before spraying or, in some cases, very satisfactorily after spraying. A study is needed to evaluate this situation, bearing in mind the extensive use of cotton insecticides, the different degrees of breakdown of insecticides in different soil types, rainfall intensity and land cover, and absorption of the insecticide by the soil. As yet, no one has shown insecticide run-off from forests into streams in sufficient amounts to show a measurable increase in the mortality of bottom organisms above that caused directly by the spraying.

Research is needed to develop better formulations and equipment for dispersing sprays to minimize losses of toxicant from the air, and removal by rain from the target plant. The improvement of operational procedures, especially for aerial spraying, might well reduce the hazard of insecticides to aquatic life. There is a definite need for a manual to cover the many problems that arise in connection with any large-scale aerial spray program. A manual based on the best procedures developed through the years of experience would serve as a helpful guide for the conduct of effective and safe programs.

Summary

INSECTS are probably man's greatest challenge to supremacy on earth. DDT and other synthetic organic insecticides have saved millions of lives by controlling insects that carry diseases, have greatly increased the yields and quality of crops, and have saved forests from destruction from insects. The quantities required are increasing each year, about 569,927,000 pounds being produced in 1956. Large quantities of these insecticides are dispersed from airplanes. It is the widespread use of insecticides that concerns the public because of their potential hazard to health and of damage to fish and wildlife.

A review of the literature with special reference to the adverse effects of insecticides on aquatic life indicates only minor losses in comparison with the vast quantities used. Other factors in land use and development appear to be more damaging than insecticides. Some losses attributed to insecti-

(*Continued on Page 99*)

The liquid fertilizer industry has, for some time, been handicapped by the supply problem of phosphoric acid. Impurities in wet-process acid are troublesome, so this type acid has not been accepted generally for use in liquid fertilizers. Furnace phosphoric acid is too expensive for use in fertilizer formulations.

Studies at the Tennessee Valley Authority (reported in the July issue of AGRICULTURAL CHEMICALS *pp. 24-26) have been directed toward overcoming some of these problems. Processes have been developed by TVA for the production and use of superphosphoric acid that contains 76 per cent P_2O_5; — and other investigations have been directed toward use of wet phosphoric acid itself in liquid fertilizer manufacture.*

The following comments are based on those presented at the June, 1959, pilot plant demonstration. In one review, J. A. Wilbanks of TVA Process Engineering Branch reported on liquid fertilizers made from wet-process phosphoric acid, where a sequestering agent is added to prevent precipitation of impurities.

The second report is based on one made by J. M. Stinson, TVA's Applied Research Branch, on a suspension technique for using wet-process acid.

LIQUID FERTILIZERS—using wet process phosphoric acid

Sequestration With Superphosphoric Acid

TVA has made tests of the production of liquid fertilizers from wet-process phosphoric acid with a sequestering agent added to prevent precipitation of impurities. Samples of wet-process acid from several sources were tested, but only one was studied in detail. Sufficient sequestrant was supplied as superphosphoric acid (76% P_2O_5) or ammoniated superphosphoric acid (11-33-0 solution) to furnish 5 to 50 per cent of the total P_2O_5 in the product.

In carrying out the tests, wet-process acid, superphosphoric acid and aqua ammonia were fed simultaneously to the reaction vessel so as to maintain an approximately neutral solution (pH about 6.6). Water was added to the reactor either before or during the reaction to adjust the grade of the final solution to about 8-24-0. Other grades were made by adding materials such as urea, nitrogen solutions, and potash salts and adjusting the water addition accordingly.

When ammoniated superphosphoric acid (11-33-0 solution) was used as the sequestrant, water required in the formulation was added to the reaction vessel along with the 11-33-0. Wet-process acid and aqua ammonia then were added simultaneously, so as to maintain an approximately neutral solution. Other grades were produced in the same manner as described above.

For evaluation of storage properties, portions of the products were stored for 30 days at room temperature. The tests indicated that to obtain liquid products that remained clear during storage under these conditions a minimum of 20 per cent of the P_2O_5 as sequestrant was required. Less sequestrant was required when it was added either before or during ammoniation rather than after ammoniation. As little as 10 per cent of the P_2O_5 in the form of sequestrant was sufficient to maintain clear liquids for one or two days at room temperature, and 15 per cent maintained clear liquids for seven days. It was noted that products containing 30 per cent or more of the P_2O_5 as sequestrant were still clear liquids after storage for as long as a year at room temperature; however, the minimum amount of sequestrant required for such long storage was not determined.

A study was also made of the production of 1:1:0, 1:2:0, 1:3:0, 1:1:1, 1:2:1, and 1:3:1 ratio liquid fertilizers from sequestered 8-24-0 base solution. The source of supplemental nitrogen was either urea or urea-ammonium nitrate solution. The salting out temperatures of these materials were measured. Portions of the products were stored for seven days at 28° to 32° F., and other portions were stored for 30 days at room temperature. Base solutions were 8-24-0 grade containing 20, 30, 40, and 50 per cent of the total P_2O_5 as 11-33-0 ammoniated superphosphoric acid.

There was little advantage in supplying more than 30 per cent of the P_2O_5 as sequestrant in the above tests except for the 1:1:1 ratio. Clear 1:1:1 ratio liquids were obtained only when 40 or 50 per cent of the total P_2O_5 was present as sequestrant. When 20 per cent of the P_2O_5 was present as sequestrant, ratios other than the 1:2:0 either formed suspensions or became gels during storage.

With urea as the source of supplemental nitrogen, the maximum grades that could be stored satisfactorily at 32° F. were 16-16-0, 11-22-0, 9-9-9, 8-16-8, and 7-21-7. These grades were as high as, or higher than, those that can be produced from electric furnace orthophosphoric acid. The salting out temperatures obtained were usually a little lower than those reported for the comparable grade from electric furnace acid, indicating some increase in solubility from the nonortho P_2O_5 added.

In tests with wet-process acids from other sources, satisfactory solutions were produced when 35 per cent of the P_2O_5 was supplied by superphosphoric acid or ammoniated superphosphoric acid (11-33-0). No other proportions of sequestrant were studied in these tests.

Several companies are now using superphosphoric acid or 11-33-0 solution as a sequestrant with wet-process acid. In one instance, superphosphoric acid has been used for a full season to supply about 40 per cent of the P_2O_5; satisfactory operation was obtained.

Suspension of Precipitated Impurities

THE suspension technique for using wet-process phosphoric acid in the production of liquid fertilizers is another line of investigation in TVA laboratories. Preliminary studies were made in glassware; the current work is being carried out in a 10-gallon reactor unit.

In preliminary work, it was found that the impurities in the acid precipitate in such finely divided form that they would not be likely to clog application equipment. However, on standing for several days, settling tends to occur. The degree of settling and the characteristics of the settled layer were found to vary widely, depending on several factors such as composition of the acid, rate of neutralization, temperature of neutralization, and use of suspending agent. Under some combinations of conditions, the settled layer which developed after standing was so dense or viscous that the product appeared unsuitable for pumping or spraying.

From this preliminary work, it appeared that use of wet-process acid would be feasible without any particular attention to neutralization technique if the product is applied to the soil immediately after it is prepared. This is the basis on which several producers are using the acid at present. However, if the product is to be stored for any extended period, then conditions of manufacture become important. Most of the TVA work has been aimed at making a product which after standing can be pumped and sprayed without difficulty.

The most difficult situation in this resepct is in that type of neutralization in which all the acid is added to the reaction tank before the ammonia addition is started. This procedure results in a relatively low neutralization rate during the precipitation stage and, as a result, the particles tend to settle at a relatively rapid rate. Suspensions produced by this method can be improved by adding the ammonia as rapidly as possible, cooling during ammoniation, and using vigorous agitation. In addition, small-scale tests have indicated that use of a small amount (1 to 2%) of an attapulgite-type clay- improves stability of the suspensions.

A better system of neutralization is that in which the acid and ammonia are added to the reaction zone at the same time, a method that is used in many plants. The reaction of ammonia and acid is very rapid so that the impurities precipitate quickly and in a finely divided form conducive to a stable suspension. Work at TVA on this type of process has been done mainly in the small reactor mentioned above. Weighed amounts of acid, aqua ammonia containing 20 per cent N, and urea — ammonium nitrate solution were fed from small feed tanks into a 10-gallon stainless steel reactor equipped with baffles and an agitator. Potassium chloride was fed from a vibrating feeder through a chute to the reactor. During operation, material was recycled from the bottom of the reactor to the top and the temperature and pH of the material measured. Water was added to the reactor first, and then the acid and aqua ammonia were added simultaneously to maintain a pH of 6.5 to 6.7. The required amounts of potassium chloride and urea — ammonium nitrate solution were added during neutralization. Cooling was accomplished when necessary by immersing a cooling coil in the material in the reactor.

Suspensions have been produced by this method which had acceptable flow properties after standing for either one week at temperatures of 28° to 32° F. or for a month at room temperatures. Grades such as 8-24-0, 6-18-6, 7-14-7, and 7-7-7 were produced. All of these could be pumped without difficulty after the one-month storage period, either with a rotary vane-type positive displacement pump or a centrifugal pump. The suspensions were not disturbed during storage and were pumped from the bottom of the container, so that initial flow was from the thicker portion of the suspension. After pumping, the products appeared to be quite homogeneous and were very fluid. The pumping rate was about the same as that obtained with water.

Although the suspensions pumped well, there was considerable difficulty in spraying them through nozzles because of the presence of fairly large crystals of a material identified as struvite, an ammonium magnesium phosphate. These crystals were very small when the suspensions were first made. On storage of the suspensions for a month, however, the struvite grew large enough to cause trouble, whereas the other precipitated impurities remained in their

(*Continued on Page* 101)

Properties of Suspension Fertilizers
Produced from Wet-Process Phosphoric Acid

Ratio	Grade	pH	Specific Gravity at 75° F.	Apparent viscosity, centipoises	% total product as A	% total product as B
1-3-0	8-24-0	6.6	1.28-1.30	45-60	3-10	90-97
1-1-1	7-7-7	6.7	1.21-1.23	20-45	20-40	60-80
1-2-1	7-14-7	6.6	1.27-1.29	30-55	10-15	85-90
1-3-1	6-18-6	6.5	1.29-1.30	50-65	6-10	90-94

(A) Upper clear liquid layer. (B) Settled suspension layer.

Reader's Digest *replies to Agricultural Chemicals on recent fire-ant story*

A NUMBER of readers have written in to comment on the article "Backfire in the War Against Insects" which appeared in the June, 1959, issue of the *Reader's Digest*. The article, by Mr. Robert S. Strother, a member of *Reader's Digest* staff, was highly critical of aerial spray programs and suggested that massive aerial spraying of insecticides is causing alarming destruction of wildlife across the country.

In one comment on the *Digest* article received by AGRICULTURAL CHEMICALS from G. R. Townsend who operates Florida Field Trials in Belle Glade, Fla., he called attention to the fact that previous articles in the same publication have been in distinct contradiction to the recent article. He referred in particular to an article which appeared in the May, 1948, issue of the *Digest*, under the caption "Whole Towns Abolish Flies." "At that time," Dr. Townsend observes, "The *Reader's Digest* was on the pro side in this argument. Maybe you might call their attention to this bit of fickleness."

In this particular article the *Digest* selected seven outstanding examples in which DDT was successfully employed to solve the house fly problem for a series of American towns and cities. Other articles carried by the *Digest* in more recent issues include the following: "Hell on Hoppers" July, 1950; "The Years of the Locust," July, 1953; "Captan: the Amazing New Fungicide," January, 1955; and "it's Not Too Late to Save Our Elms," August, 1957.

AGRICULTURAL CHEMICALS queried the *Reader's Digest* on the qualifications of Mr. Strother to prepare an article on a technical subject such as this, asking particularly what entomological training he might have. The *Digest* replied that "Mr. Strother is qualified by wide experience to evaluate data in this field and his report was published only after full documentation of the details, by him originally and in further checking by our research department." In discussing Mr. Strother's training for his job with the *Digest*, they indicated that "Bob Strother and a skittish horse named Pedro entered the publishing business simultaneously as partners in a newspaper delivery route in their home town of Winfield, Kansas." They report that he attended Southwestern College and the University of Kansas and that after leaving college in 1925, he had 10 years of varied newspaper experience, later was an AP correspondent, news-bureau chief of *Time* magazine, on various Army publications and joined the international editions staff of the *Reader's Digest* in February, 1949.

On the general subject of the spray programs against which Mr. Strother leveled his attack, the *Digest* editors replied "The whole question of massive aerial spraying of insecticides—and this rather than carefully evaluated spot eradication is the topic being discussed—remains hotly controversial, as the conflicting reports given in the article indicate. But in spite of your criticism and others to be expected, there seems ample reason in view of the alarming destruction of wildlife across the country and the future implications of these programs, especially as they may affect human life, for Robert S. Strother's suggestion of caution where large scale broadcasting is concerned. Pending further research, which was recommended by all witnesses before the Congressional committee investigating the problem, the recommendation for more care than has been exerted in the past strikes us as quite justified. The author does not rule out all aerial spraying, however, but discusses it in terms of 'small areas and real emergencies.' "

Continuing our attempt to clarify the basis for the *Digest's* article, we renewed our query as to whether or not Mr. Strother has had any actual technical training, as distinct from his wide experience as a newspaper man, to cover an involved entomological subject such as this, adding that "Our own feeling is that when you get a public health problem such as this, with its entomological background and scientific overtones, the writing should be done by someone with specific training in the particular science under discussion, and a serious effort should be made to present the truth—and the whole

(*Continued on Page* 102)

Screening

GRANULATED MIXED FERTILIZERS BETWEEN THE DRYER AND COOLER

WE went into the granulation of mixed fertilizer in Indiana Farm Bureau Coop Assn. the spring of 1955.

There were not many plants granulating at that time, and therefore, there was not too much experience on the overall granulation operation.

We chose to screen between the drying and cooling operation. It appeared to us this was advisable for several reasons:

1. The oversize would still be moist inside and therefore would crack readily to proper size. The hard dry outer layer would help keep the mill from plugging.
2. After cracking, while oversize was still hot, we could run it back to the dryer and save fuel, because we would not need to build up temperature to take out the remaining moisture.
3. The fines could be immediately put back into the ammoniator and because they are still hot they would not cool the ammoniator bed. We could get by with less reaction heat, therefore use less acid.
4. We could have much more efficient cooling because we would have only product going through cooler, the cooler load would be reduced by the amount of the recycle which often amounts to 100% of production rate.
5. Then there was a fifth reason. We already had a cooler, but to work it into the conventional system, we would have had to make some expensive alterations. So we decided the best way to go was to dry, screen, then cool.

The actual operation has not worked out as we had hoped. First the oversize unless it was quite a bit too large, was not so wet inside and after it was cracked or crushed, dried very fast—so we soon put in a bypass after the crusher and ran the material back to the screens.

Another reason too, for the bypass, was to take the load off the dryer. This recycle load seemed to build up unusually fast.

One reason was because if the recycle was not cracked the first time through, it would be one half hour before it went through again; the half hour being the time it takes to go through the dryer.

It seemed that hot fines might help in the granulation process, but that, too, has not been an advantage, since the acid rates are the same at all plants.

There are also other disadvantages to screening hot material. It is no fun trying to clean the fine, bottom screen with hot pills going up your sleeve or down your neck, —so unless your foreman is constantly watching, the screens will blind and fines go to product.

Unless you use stainless steel wire, screens do not last very long. Even with stainless the hot heavy laden ammonium nitrate fertilizer sticks and builds up fast.

And it gives you chills seeing men with scrapers, rubber hammers, or what have you, cleaning high priced stainless steel screen cloth. Most of the screen cloth doesn't wear out, it just gets cleaned to pieces.

Then too, it is always "fun" to clean a screen after a batch of fertilizer that has too much acid or has gotten too hot in the dryer, or for some other reason has become really gummy, has been delivered to screen. This doesn't happen very often, but when it does you have yourself a mess.

Well what I am saying is I would rather screen after cooling. In the three processes, we put in following the Indianapolis installation, we screen after cooling.

One thing is very true, I think, and that is the cooler is much more efficient when you screen before cooling.

However, you still must have proper equipment. Even though we set up to screen then cool at Indianapolis, we found our cooler would not do the job and we had to change.

Since then, cooling has not been a problem. So, I would rather size the cooler to do the job then screen after cooling.

In a discussion of the advantages and disadvantages of screening granulated mixed fertilizer, between the dryer and cooler, versus screening after the cooler, L. M. Leach, Indiana Farm Bureau Cooperative Association, Inc., Indianapolis, reported on his experiences at the Fertilizer Industry Round Table meeting, Washington, D. C., November, 1958.

As predicted, the House gave its approval to H.R. 6436 — which includes nematocides, plant regulators, defoliants and desiccants under the Federal Insecticide, Fungicide and Rodenticide Act. It is anticipated that the Senate will take similar action shortly. See story on page 87.

- - Pesticides,

some observations on their regulation

by Joseph A. Noone*
National Agricultural Chemicals Association

THE most important recent developments in the regulation of agricultural chemicals are two bills now pending in the Congress. They would amend the Federal Insecticide, Fungicide, and Rodenticide Act so as to extend its coverage to nematocides, defoliants, desiccants, and plant regulators. The bills are identified as H.R. 6436 introduced on April 15, 1959, by Congressman Cooley of North Carolina, and S. 1900 introduced on May 11 jointly by Senator Holland of Florida and Senator Aiken of Vermont. Hearings were held on H.R. 6436 by the full House Committee on Agriculture on May 21. At the hearing, representatives from the U.S. Department of Agriculture, land-grant colleges, the Association of American Pesticide Control Officials, farm and grower organizations, and the agricultural chemical industry appeared and testified unanimously in favor of the bill and urged its enactment. The Department of Health, Education, and Welfare filed a report supporting the bill, but suggesting an amendment to more clearly define their authority over residues in food during the transitional period provided for in the bill. In light of the strong support for the bill and the lack of any opposition to it, the committee voted to approve the bill with the new amendment immediately following the hearing. It is now expected that the bill will receive consideration by the full House of Representatives within the next few weeks. Favorable action is anticipated, and we expect that the bill will become law before the Congress adjourns.

The original Federal Insecticide Act was passed in 1910 and covered only insecticides and fungicides. The present Federal Insecticide, Fungicide, and Rodenticide Act was enacted in 1947 to reflect the then current situation as regards pest control chemicals and agricultural practices. It regulates the labeling and marketing of insecticides, fungicides, herbicides, and rodenticides which are collectively referred to in the Act as "economic poisons" and commonly known as "pesticides".

Since 1947, several new types of agricultural chemicals have been developed and have found widespread commercial application. These new products are generally referred to and are designated in H.R. 6436 and S. 1900 as nematocides, defoliants, desiccants, and plant regulators.

Conflicting Regulations

It is standard practice to regulate products sold to farmers and growers. When these agricultural chemicals began to find widespread use, the question of how to regulate them and under which laws began to develop. Nematocides posed very little problem; they could be regulated under the federal and state pesticide laws merely by the issuance of a regulation declaring nematodes to be pests. Defoliants and desiccants were put under the pesticide laws in a few states by the addition of some extra provisions, but this was not always done in a satisfactory manner from a technical or legal standpoint. The advent of plant growth regulants, particularly the gibberellins, threatened to precipitate a regulatory crisis. Some states began to regulate them under the fertilizer laws, some under their pesticide laws, and a few others under special laws. This situation obviously was not to the best interests of the growers, the regulatory officials, or the agricultural chemicals industry. The varying and conflicting requirements of these laws prevented any uniform labeling, marketing, or regulatory practices. The free flow of these products to farmers, growers, and others was being impeded. Industry found it difficult and, in some instances, impossible to comply with all the laws.

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*Presented at the Seventh Annual Convention of the Association of Southern Feed and Fertilizer Control Officials, Hot Springs, Arkansas, June 9, 1959.

After careful consideration of the various issues involved, industry decided that, if these products were to be regulated, they should be regulated under an amended and expanded pesticide law rather than under other types of laws.

Experience has shown that regulation of agricultural pest control chemicals under the Federal Insecticide, Fungicide, and Rodenticide Act and the counterpart State Acts has been effective and beneficial to farmers and growers. Accordingly, it appeared desirable that the same type of regulation, under the same acts, should be applied to these more recently developed products. This is particularly important in view of the fact that a certain chemical may find use as a pesticide and also as a defoliant, desiccant, and/or plant regulator. Thus, 2,4-D may be used at one concentration as a herbicide, whereas at a much more dilute concentration it may be used on certain trees as a plant regulator to lessen premature fruit drop. The use as a herbicide is now subject to the Federal Insecticide Act and the state pesticide laws, whereas the use as a plant regulator is not. The same situation exists as regards many other agricultural chemicals which are subject to the pending federal legislation. It is desirable and important that all these agricultural uses should be regulated in a uniform manner at both the federal and state level.

The conflicting pattern of regulation over defoliants, desiccants, and plant regulators and how it should be resolved was the subject of considerable discussion during the annual meetings of the Association of American Pesticide Control Officials and the Association of American Fertilizer Control Officials in October, 1957. The two Associations adopted resolutions proposing that a joint committee from the two Associations be appointed to review the situation and report back to the 1958 meetings. This was done. Following a careful study, the joint committee recommended to the two Associations at their 1958 meetings that:

> "(1) Any regulatory control deemed necessary over agricultural chemicals, intended to affect the psysiological processes of plants such as gibberellins, plant regulators, desiccants, and defoliants, other than plant foods, should be imposed by amendment to the Uniform State Insecticide, Fungicide, and Rodenticide Act and the counterpart state acts, rather than under the State Fertilizer Laws."

Both associations adopted by resolution this recommendation. The Association of American Pesticide Control Officials also adopted another resolution which reads, in part, as follows:

> "Be it resolved, that this Association recommend and endorse the expansion of the existing Federal Insecticide, Fungicide, and Rodenticide Act to perpetuate uniformity between the scope of that law and the related State Statutes, and
>
> "Be it resolved further, that the Association will support and cooperate in the broadening of the Federal Act by Amendment or otherwise to include chemicals intended for use as nematocides, desiccants, defoliants, and plant regulators."

The bills now pending in the Congress, H.R. 6436 and S. 1900, are in full accord with the principles of those resolutions. A B. Heagy, Secretary-Treasurer of the Association of American Pesticide Control Officials appeared at the House Agriculture Committee hearing and very ably testified in support of the Legislation.

While the aforementioned studies and discussions relative to the regulation of defoliants, desiccants, and plant regulators were in progress, another important development occurred. After several years of consideration of numerous bills, the Congress passed and on September 6, 1958 President Eisenhower approved a Food Additive Amendment to the Federal Food, Drug, and Cosmetic Act (P.L. 85-929). While that legislation was directed primarily at chemicals intentionally added to food, its coverage was broad enough to encompass nematocides, plant regulators, defoliants and desiccants whose use results in residues in or on food or feed. Thus, these products became subject to regulation under the Food Additives Amendment.

Pending Legislation

Let us now review briefly the pending legislation. Since H. R. 6436 has already received Congressional action in the form of a Committee hearing and approval, and is the bill likely to be enacted by the Congress, I will discuss it. However, S. 1900 is an identical bill and my remarks about H.R. 6436 are equally applicable to it.

As previously noted, H.R. 6436 would amend the Federal Insecticide, Fungicide, and Rodenticide Act so as to extend its coverage to nematocides, defoliants, desiccants and plant regulators. It would accomplish this objective primarily by expanding the present definition of "economic poison" in that Act to include these products. It would also amend certain other definitions in the Act and add some additional ones, as necessitated by the broader coverage. However, it does not change the substantive provisions of the Act as they relate to presently regulated products.

The bill would directly subject the products involved to the same labeling, registration, and regulatory controls under the Federal Insecticide Act as now apply to agricultural chemicals used for pest control purposes. By placing them under that Act, the bill would also effectively, although indirectly, place them under the "Miller Pesticide Chemicals Amendment" to the Federal Food, Drug, and Cosmetic Act (P.L. 518, 83D Congress), insofar as residues

(Continued on Page 91)

Pesticide Exports to Egypt,

India, Mexico, - Up in 1958!

Overall Exports Under '57 by 4%

FOR the first time since 1954, pesticide export values showed a drop in 1958 under the previous year. 1957 exports totaled $86,002,000, while 1958 amounted to $82,066,014. Exports to Egypt, India and Mexico, however, show substantial increases, a reversal of the overall picture.

Total value of exports to India in 1957 was $6.9 million, against $7.2 million in 1958. DDT exports to India in 1957 amounted to $5,166,984, compared with $6,957,967 in 1958; practically all of the 1958 shipments were 75% material, and presumably the same was true of the 1957 exports, — but the available published record does not show a breakdown for the earlier year. The high DDT exports reflect the program to eradicate malaria in India.

Total pesticide exports to Egypt were $2.1 million in 1957, $5.7 million in 1958. Substantial export of toxaphene for cotton insect control accounts for a large part of the 1958 figures. Of the 1957 exports to Egypt, 83.7 per cent, or $1,785,000, fell into the "agricultural basket", — and an additional $175,000 was composed of sulfur formulations, probably largely cotton dusts.

U. S. shipments of DDT to Mexico totaled $3,558,000 in 1957. Total DDT exports, both technical and formulated, to Mexico in 1958 amounted to $4,362,000 (technical $3,520,641). The movement of large quantities of technical DDT to Mexico was caused by the prospects of new Mexican production capacity in the near future, and pending stringent import controls.

The bulk of exports are being financed by the U. S. Government to improve public health and raise living standards in underdeveloped areas. An indication of the extent of such programs is that exports of DDT in 1958 accounted for nearly 50 per cent of the total U. S. production. The high rate of exports is continuing this year at an accelerated pace. In January, 1959, for example, DDT exports jumped

(Continued on Page 103)

Table I. Selected Shipments in Excess of $1 Million

Commodity	Country	Value
DDT, formulations containing 75% or more	India	$6,902,373
"Polychlor" insecticides, n.e.c.	Egypt	4,081,191
DDT, technical	Mexico	3,520,641
"Polychlor" insecticides, n.e.c.	Mexico	2,907,901
Fungicides	Brazil	2,252,670
Herbicides, n.e.c.	Canada	1,588,876
Agricultural insecticides, n.e.c.	Egypt	1,504,213
Fungicides	Canada	1,485,512
Agricultural insecticides, n.e.c.	Nicaragua	1,428,348
Household and industrial pesticides, n.e.c.	Venezuela	1,340,052
"Polychlor" insecticides, n.e.c.	Indonesia	1,077,012
Disinfectants	Canada	1,036,883

Table II. Commodities Exported in Order of Value

Commodity and commodity number	Valued $500 and over	Est. ship. $100-499	Total
"Polychlor" insecticides, n.e.c. (82230)	$17,477,849	$147,240	$17,625,089
DDT, formulations containing 85% or more (82070)	11,980,503	12,260	11,992,763
Agricultural Insecticides, n.e.c. (82240)	10,154,116	458,100	10,612,216
Fungicides (82250)	7,438,402	203,330	7,641,732
Herbicides, n.e.c. (82085)	5,854,514	132,410	5,986,924
Household and Industrial Pesticides, n.e.c. (82270)	4,962,004	581,660	5,543,664
DDT, technical (82062)	5,029,527	38,380	5,067,907
Organic phosphorus insecticides (82220)	4,163,085	80,620	4,243,705
Disinfectants (82280)	2,994,870	513,960	3,508,830
2,4-D and 2,4,5-T herbicides (82080)	2,895,795	33,320	2,929,115
DDT, formulations containing 20 to 74% (82065)	1,692,528	58,280	1,750,808
Benzene hexachloride (82075)	1,472,471	9,780	1,482,251
Copper sulfate, normal (82010)	1,114,284	61,660	1,175,944
Fumigants (82260)	1,066,927	45,050	1,111,977
Lead arsenate (82020)	408,611	3,800	412,411
Paradichlorobenzene (82056)	366,042	23,630	389,672
Agricultural sulfur, n.e.c. (82210)	253,298	16,890	270,188
Pyrethrum extract (82053)	169,531	14,130	183,661
Calcium arsenate (82030)	80,751	—	80,751
Nicotine sulfate (82001)	53,316	3,090	56,406
Total	$79,628,424	$2,437,590	$82,066,014

TECHNICAL SECTION

Batch VS Continuous Fertilizer Manufacture*

SINCE the beginning of the study of granulation of mixed fertilizer, a major question has concerned how to provide uniform conditions for granulation—that is, uniformity of temperature of fertilizer entering the dryer, of the amount of liquid phase of the fertilizer discharging from the mixer or entering the dryer, uniformity of quantity of fertilizer at any given point along the length of the dryer or cooler and finally uniform load on the classification equipment.

The importance of uniform temperature, moisture and load conditions to granulation has been described by many Round Table participants. It follows, therefore, that a satisfactory continuous method of mixing overcomes a major problem in granulation. Any attempts to develop a feeder between batch mixer and dryer which would maintain a fertilizer mass of uniform granulating characteristics have been only partially successful.

With a recognition of these basic principles coinciding with the development of the T.V.A. continuous ammoniator, it is understandable that the vast majority of granulation units installed during the past four years include this ammoniator-granulator.

The question, I believe, is not between the basic principles of batch versus continuous process of granulation. The question is between the two methods at their present stage of development. Either within or out of the fertilizer industry, batch mixing is much older. We are comparing two methods of differing stages of development and of widely different background of experience by technical or operating personnel in the industry.

The result of appraisal of the two processes using equipment now available can favor continuous or batch depending on some conditions affecting an individual plant—such as plant size, amount of fertilizer granulated, existing equipment and space limitations if a conversion and technical personnel available. Now, let us look at a few cost factors:

The investment is somewhat larger for continuous mixing than batch equipment. Unless individual feeders are installed for each ingredient, a premixer is necessary. The dry ingredient feeder in advance of ammoniator plus the meters for ammonia or solution and for acid are more costly than volumetric measuring tanks. In some installations an additional elevator is required with continuous method. The net increased investment can be as much as $25,000. On an annual tonnage of 10,000 tons granulated, this is about 25 cents per ton but on 25,000 tons, it is only about a dime.

Electricity or labor cost is very similar, not usually enough to be a factor. The premixer can be operated using air by the weighman or by automatic device.

Delays during the "Shakedown cruise" or later with the continuous method are largely related to unfamiliarity with the characteristics of new equipment, such as feeder, meters, sparger pipes, scraper, and any control equipment installed. These are integral parts of a continuous process. Information is sometimes scanty on the application of this equipment to fertilizer use. The problems and delays can at times be exasperating, although not significantly affecting costs.

The major difference in the economics of these two methods is in formulation, resulting from greater ammonia retention with the continuous ammoniator, particularly with high nitrogen grades toward which there is a trend in usage. With a 10-10-10 or 12-12-12 the nitrogen loss can be maintained at about 0.10 unit in a continuous ammoniator of known proper design, whereas the loss in a batch mixer with a similar formula is approximately 0.60-0.75 units. The difference is about $0.80 per ton—a significant figure. If fume control equipment has to be installed, that difference can increase substantially.

In a small plant, for a wide range of nitrogen-to-phosphorus grades, a batch mixer is satisfactory, providing fume control is not a consideration. For large tonnages, especially where high nitrogen grades are to be made, the per-ton savings and improved operating performance justify the added investment required for a continuous process. If in a congested area, a continuous ammoniator is now the most economical way to reduce gaseous effluent. Added technical developments such as preneutralization and added operating experience will most likely increase the relative merits of continuous mixing.

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*Participating in the discussion on fertilizer manufacture at the Fertilizer Industry Round Table meeting, November, 1958, in Washington, D. C., was Roger C. Smith of the Eastern States Farmers Exchange. His comments are reproduced here.

Regulators May Aid Pest Control Methods:

Three plant-growth regulating compounds that will exude from the roots of treated plants into surrounding soil in quantities sufficient to be reabsorbed by nearby plants have been reported by the U.S. Department of Agriculture.

This discovery, arising from basic research on the movement of chemicals within plants, gives scientists of USDA's Agricultural Research Service hope of finding similar substances with plant pest control potential. If a chemical that will protect plants against diseases, insects or nematodes could be mobile within plants like these substances, farmers would have an important new weapon in their fight against pests.

The recently tested substances are the meta-chloro, meta-fluoro, and para-fluoro halogenated forms of alpha methoxyphenylacetic acid (MOPA), reported in 1955 by the Department as a promising "systemic," with unusual ability to be moved or translocated throughout the plant. Like MOPA, the three chemically-related forms can not only be translocated but can also be exuded from plant roots in their original chemical form.

Another systemic form of MOPA called mandelic acid was found to have no growth-modifying effect. And, although mandelic acid cannot be exuded from roots, this indicates to scientists that the characteristic of a compound to be translocated can be independent of any property it may have to modify plant growth. Thus, it may be possible to develop systemic chemicals of different kinds to serve a variety of purposes.

Basic research leading to these discoveries is being conducted by scientists in the Growth Regulator and Antibiotic Laboratory at the Plant Industry Station, Beltsville, Md.

In much of the research, ARS scientists have used radioactive tracers in the systemics to track the movement of the compounds through plants. In addition, the analytical technique known as chromatography—in which various compounds are separted one from another on treated paper by a flow of an organic solvent such as alcohol—has made it possible to identify the form of presence of a chemical at particular locations within plants.

•

Control of Alfalfa Weevil

In a new bulletin available to dairymen and others concerned with production of alfalfa, Dr. R. Quinton of the Connecticut Agricultural Experiment Station reports on control of the alfalfa weevil. Heptachlor, granular, at the rate of 40 lbs. per acre controlled alfalfa weevil larvae.

Herbicide Notes—based on reports presented at NEWCC, 1955

- Randox in a pre-emergence treatment gave better weed control in onions grown in mineral soils in Pennsylvania than either Chloro IPC in a pre-emergence treatment or KOCN applied at time of onion emergence. Post emergence treatment had little effect.
- Applications of herbicides at emergence in West Virginia gave more effective weed control in corn than pre-emergence applications.
- Tests conducted in Pennsylvania indicate that Dinoben is an effective pre-emergence crabgrass control chemical, but two to three applications of 8 to 10 pounds per acre are needed.
- A Neburon - Dalapon combination showed promise for early post-emergence weed control in pure stand alfalfa, according to Connecticut tests.
- For maximum results with Simazine, applications must be made before active growth begins and it should be applied before or during the period of maximum rainfall.
- Amino Triazole alone and in combination with other chemicals, offers some promise for controlling certain hard to kill species of brush such as ash, sumac, and black locust in Virginia. Conversely, it has little effect on black gum and sassafras.
- Research carried out during the past ten years on the translocation of 2,4-D in plants indicates that this compound is moved in the assimilate stream from regions of food synthesis to regions of food utilization.
- A resistant strain of wild carrot may possess some 2,4-D detoxification mechanism which is not possessed by susceptible plants. Such a mechanism would have to be specific for the 2,4-D type of herbicide as resistant plants are killed by the closely related chemicals, 2,4,5-T and Silvex. Further studies on the exact nature of this detoxification are being carried on.
- EPTC failed to control weeds when applied to wet soil but weed control was enhanced on dry soil by either cultivation or irrigation after application. CDE was more effective when applied to dry soil than on wet soil. Soil moisture, however, had little or no influence on the effectiveness of CIPC.
- ATA at the rate of 8 pounds per acre of active material gave good weed control in a mature vineyard in tests conducted in West Virginia. ATA at 4 pounds per acre and a combination of Dalapon and ATA gave satisfactory control.

Fertilizer Views and News

By Vincent Sauchelli

Dr. Sauchelli is Chemical Technologist for National Plant Food Institute.

G for Gypsum—More about Ionic Relationships in Soil

WHAT happens, chemically, when fertilizer is mixed with soil, or placed in a water culture or dissolved in water as in fluid fertilizers? It splits up into parts called ions, which are further differentiated into cations carrying a positive charge of electricity, and anions, with a negative charge. The action is called ionization. For example, sodium nitrate in solution yields sodium $(Na)^+$ and nitrate $NO_3)^-$ ions. Fertilizers are, in the language of chemistry, "salts," consisting of one part called the base (the cation) and one part, the acid (anion). This is elementary chemistry, of course; and yet, how strange that so many, who should and do know better, ignore this simple fact.

It was K. Bondorff, a Dane, who back in 1923 pointed out that fertilizers, being salts, would produce *salt effects* in the soil solution. Dr. Hugh Nicol, a noted British scientist, has in recent years aroused interest in these same salt effects*, by stressing they are of fundamental significance in a proper understanding of how fertilizer acts to feed plant life. His numerous contributions on the subject point up the logical consequences of the biological effects of the ions of a salt, and how prevalent among agricultural workers are the misapprehensions about such ionic effects. A brief digest of some of Dr. Nicol's comments follow:

In most of the general discussions of fertilizers, it is more usual to refer to the nutrient elements N, P, K, rather than to the totality of the chemical components; that is, to the anions as well as the cations. The anions seem to be disregarded. (In this connection the phosphatic anions $(H_2PO_4)^-$ and $(HPO_4)^{--}$ are excepted.) The main emphasis is generally on the N, P, K nutrient elements; sometimes, secondary and micro-nutrients may be included. This practice is indefensible in view of the known effects which the chemical partners of the nutrient triad (the anions) create in the soil solution. It must be remembered that when a fertilizer compound is put into the soil to improve crop growth, two functions operate: a nutrient function resulting from the effect of the N, P, K, and other cationic factors; and a saline or anionic function due to the presence of the negatively charged ions. The fertilizer ions enter into a complicated chemical relationship with ions already present in the soil solution and on the colloidal complex of the soil.

An example may help to visualize the action: When normal superphosphate is placed in a soil, it ionizes, and the calcium phosphate portion yields calcium $(Ca)^{++}$ and $(H_2PO_4)^-$, $(HPO_4)^{--}$ ions. The gypsum or calcium sulfate portion of the superphosphate also ionizes to yield $(Ca)^{++}$ and $(SO_4)^{--}$ ions. Ammonium sulfate in a soil yields $(NH)^+$ and $(SO_4)^{--}$ ions. Muriate of potash yields $(K)^+$ and $(Cl)^-$ ions. Now it would be just as wrong to interpret field responses from sulfate of ammonia by sole reference to its $(SO_4)^{--}$ ions, as it is to attribute all its effects to the $(NH_4)^+$ ions. Similarly, it is wrong to credit responses to normal superphosphate exclusively to the phosphatic ions or to the calcium ions. Both kinds of ions are present, and both exert their respective actions. Agronomists have to a large extent recognized this, and in conducting field tests on phosphatic effects, prefer to use triple super because it contains little or no calcium sulfate.

Furthermore, while scant consideration is given to the saline or anionic influences in soil reaction, the physical effects of the combined ions are for the most part ignored or considered of no consequence. One result of this attitude is evident in the way liming is considered. Lime may supply either calcium or magnesium or both, and to lime a soil is to furnish these nutrient elements as well as to affect the acidity. Liming is generally regarded as somewhat different from the application of calcium or magnesium in the form of chemical fertilizer. This is indeed strange. No two practices, that is, liming and fertilizing, could have a more identical function. Each is to furnish the soil with nutrients for improving crop growth. The effect of one practice cannot be divorced from the effects of the other.

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*Proc. No. 39. The Fertiliser Society (London); *Fert. & Feedstuffs*, 1957, December 4 issue.

G and pH

AGRICULTURAL workers have a means for measuring the degree of acidity or the hydrogen ion concentration of the soil. This is expressed as the pH or the negative logarithm of the hydrogen ion concentration. Dr. Nicol believes, as a result of investigations at the West of Scotland Agricultural College conducted by Dr. C. L. Whittles, that it is necessary to measure also the electrical conductivity of the soil solution, if one is to understand the nature of ionic balance. For this purpose, one needs to have a material point of departure, a referrent. This is provided by calcium sulfate or gypsum. Experiments have shown that calcium sulfate has an ionic balance so close to that found in humid agricultural soils of northwestern Europe that it can serve as the model salt. The ionic balance of salts in soil solution may be measured, by conductivity equipment, with reference to properties of calcium sulfate. It is calculated from proportions of ions, or by taking account of chemical or electrical properties. Agreement with or deviation from the chemical balance of a neutral salt, such as calcium sulfate, can thus be measured whether in a natural water or in a water extract of soil treated or untreated with fertilizer or lime. The resultant solution may be regarded as in chemical or calcium-sulfate balance when the total cations and the total anions are in the same ratio by weight of 1:2.4. This is the ratio of these ions in calcium sulfate. This weight ratio can be represented by the capital letter G, the initial letter of gypsum, the common name for calcium sulfate.

If the G value of a soil solution deviates significantly from 2.4, that soil is considered either abnormal naturally, or made so by faulty fertilization. The G ratio cannot indicate anything about the degree of acidity or of the effect of the concentration of salts. Electrical conductivity measurements will gauge the total effect of salt concentration just as pH gauges the degree of acidity, G involves the ratio of the totality of ions in the solution.

Any fertilizer may be considered as a single substance, or as a compound of mixtures for these measurements. For example, the G value of muriate of potash (KCl) is 0.91. Compared with the G valve of gypsum, it is low and thus in a mixture it would tend to have a strong unbalanced effect. Dr. Nicol deduces from this that the chlorine anion $(Cl)^-$ should not of itself be condemned as toxic in a fertilizer, but instead that when muriate is used as a fertilizer its undesirable effects are to be attributed to its unbalancing effect. Sulfate of potash has a G value of 1.23, which is much better than that of muriate. Nitrate of potash (KNO_3) has a G value of 1:58 which is still better. G for nitrate of soda is 2.70. Hence, a mixture of nitrate of soda and muriate will give a better ionic balance than nitrate of potash alone. In all cases involving total effects of a fertilizer mixture, all the ions—cations and anions—are to be considered, and not merely those usually regarded as having a nutrient value.

pH/pC Concept

Fertilizer salts exert a dual effect—nutrient and saline—in the soil solution, the one inseparable from the other. The G or anion-cation ratio is only one single expression of the complete saline function with which are associated always the effects on soil reaction measured as pH and on electrical conductivity measured as pC. The pC value is expressed as the negative logarithm of the conductivity measured in mhos. The pH and pC measurements are to be made whenever fertilizer salts are involved having alkaline and acidic properties. Dr. Nicol suggests the equation $pL = 2pH - pC$ be used to measure this relationship.

More of these considerations will be given in future releases. Enough has been given, perhaps, to suggest that there is more to this problem of soil fertility and its relationship to crop growth than is provided by the oversimplified considerations usually accorded it even in agronomic circles.★★

Midwest Fertilizer Safety School Aug. 18-19 in Chicago.

THE Midwest Regional School on Accident Prevention in Fertilizer Plants will be held August 18 and 19 at the National Safety Council's headquarters in Chicago. The school is sponsored by the National Plant Food Institute and the Fertilizer Section of the National Safety Council.

The school will offer supervisory personnel a close look at hazards and methods of control of accidents. It is intended for production managers, safety supervisors, plant superintendents, and foremen of fertilizer plants.

The fundamentals of accident prevention will be discussed by Roy Benson, manager of industrial sections, NSC. He will offer a balanced safety program.

John E. Smith, director of safety for the Spencer Chemical Co., Pittsburgh, Kans., will outline the safety job for all line management and supervisory people. To be included in Mr. Smith's presentation is a safety film entitled, "No One Else Can Do It."

The principal unsafe acts leading to accidents will be covered by Glen Griffin of NSC in his talk, "Personal Factors in Safety."

Following the introductory presentations, those attending the school will be assigned to small groups and given actual safety problems to solve.

The final speaker is to be L. L. Lortscher, Spencer Chemical Co., Columbus, Ohio, who will discuss the safe use of liquid materials in a fertilizer mixing program.

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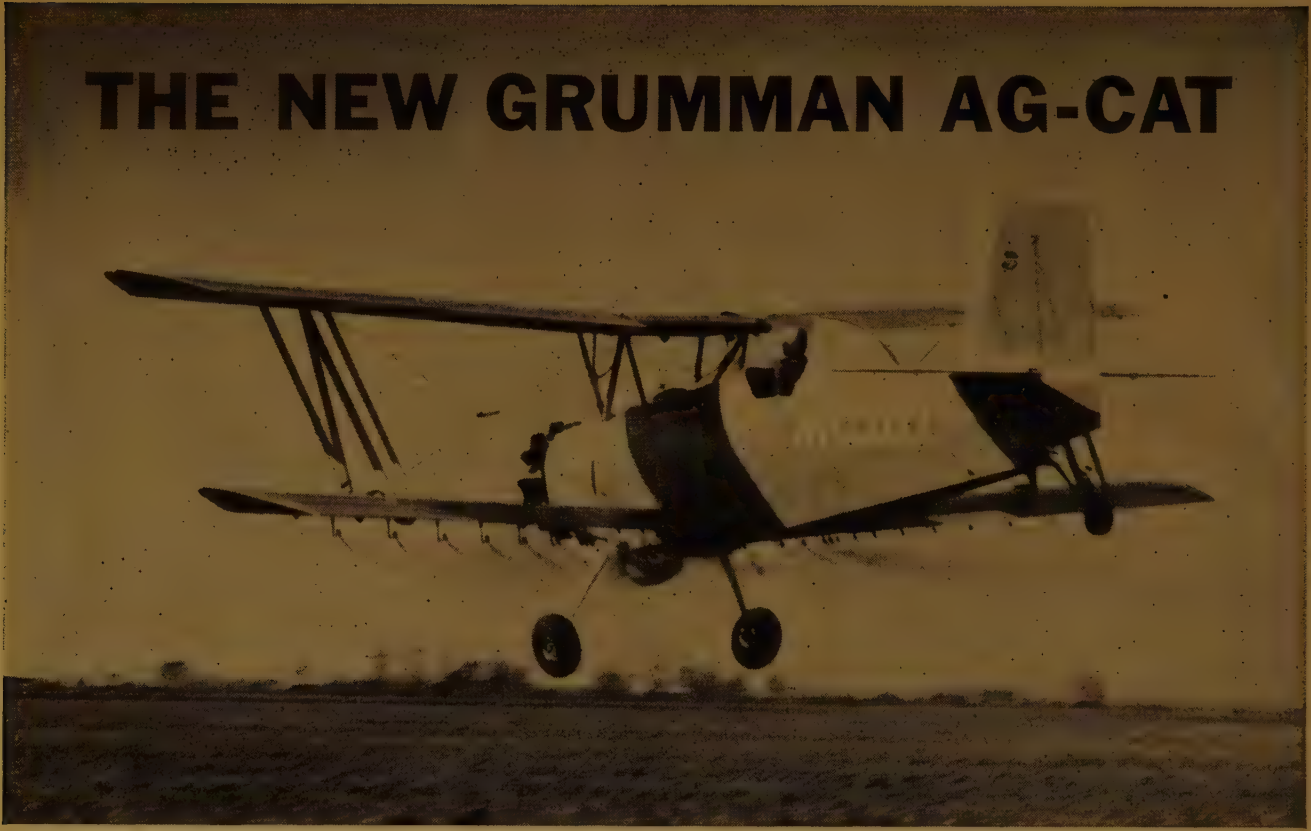

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Wing span	35 ft. 8 in.
Over-all length	24 ft. 4 in.
Maximum height	10 ft. 9 in.
Maximum gross weight	3700 lb.
Fuel	34 gal.
Oil	5 gal.
Hopper capacity	29 cu. ft. (217 gal.)
Hopper load restriction	1200 lbs.

PERFORMANCE

Normal working speed	75 mph
Take off distance @ 3700 lb.	750 ft.
Rate of climb @ 3700 lb.	500 fpm

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A Tractor-Mounted Fumigant Applicator

by Paul M. Eide

Northwestern Washington Experiment Station
Mount Vernon, Washington

FOR some reason as yet unknown, the woods weevil in Western Washington seems to be completely immune to pre-planting soil treatments of Aldrin, Heptachlor, or other chlorinated compounds that have proven effective in controlling the common strawberry root weevils. Although the adult wood weevils are very susceptible to apple pomace bait, their irregular life pattern frequently causes failures with this method of control. For those cases where the weevils escape the bait, a method of soil fumigation using ethylene dibromide and the applicator described in this article, has been devised.

Ethylene dibromide (EDB) is a heavy liquid that vaporizes somewhat like gasoline. When injected into the soil, the vapors kill weevil grubs and many other soil pests. Plant life is remarkably tolerant to EDB at dosages sufficient to kill insects, and occasionally strawberries have shown improved growth where it was used even though no insects were involved.

The tractor-mounted power applicator, as shown in Figure 1, features a small, bronze marine gear pump driven by a power take-off that draws the EDB directly from the container and forces it through plastic tubes to a chisel which places it in the berry row to a depth of four to six inches. The chisel should be mounted behind a plow coulter (Fig. 2) which cuts into the center of the matted row and prevents damage to plants. The amount of EDB used depends on the pressure and the size of orifice in a small disc located in the flow-regulator assembly. These discs are purchased with the flow-regulator assembly.

The metering discs are made with holes of several sizes as indicated by a number stamped on each. Sizes .016, .020, .024, .028, and .035 should be sufficient for any combination of tractor speed and pressure. With this type of injection equipment, the tractor must be operated at a constant speed and the dosage regulated by varying the pressure and the size of the metering disc. The lowest dosage giving good control is one cubic centimeter per foot of row of 85 per cent EDB. This amount is delivered with 25 pounds pressure and an .024 disc at a tractor speed of two miles per hour. At three miles per hour, the pressure should be about 23 pounds with a number .028 disc. In rows 42 inches from center to center, one cc per foot will equal about 3⅓ gallons per acre. The area between the rows does not need to be treated for weevil grubs. The easiest way to determine the correct amount of EDB is to determine how many feet the tractor travels in one minute, then the pressure can be set with the proper disc to deliver the same number of cubic centimeters in one minute.

This treatment gives equally good control of grubs of two of the common black species of strawberry weevils, as well as the obscure root weevil. Since EDB formerly was considered a standard treatment for wire worms, this treatment also should control these if they are present. EDB is not considered particularly effective for symphylids, but it controls some species of nematodes very well.

Although developed specifically to control the woods weevil, the tractor-mounted applicator described here will find use against many other soil pests in all sections of the country, Simple in design, it can be built by an applicator

(Continued on Page 95)

FIGURE 1.

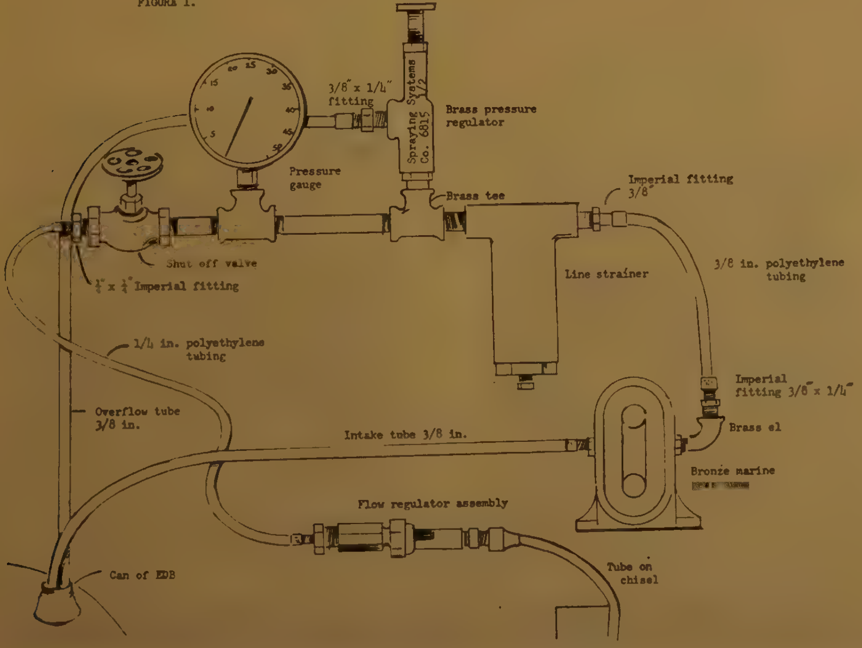
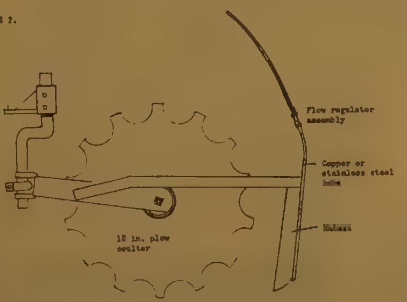


FIGURE 2.



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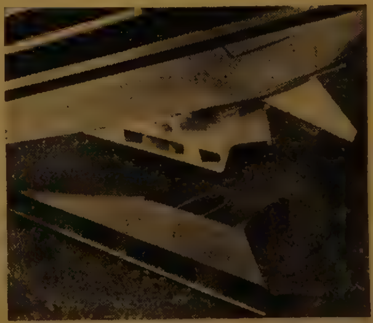

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MORE PEOPLE HAVE BOUGHT PIPERS THAN ANY OTHER PLANE IN THE WORLD

Aerial Spraying In Great Britain

by R. C. Amsden
Chesterford Park Research Station (England)

IN England, aircraft first were used experimentally in agriculture in 1947 for crop spraying duties, and today this is still their major use. The growth in the use of spray aircraft, however, has been very rapid. Among the reasons for this are:

The development during and since the war of many new effective pesticides and herbicides.

The development of the helicopter.

The availability of suitable surplus aircraft and spares after the war.

The ever-increasing awareness of the farmer and the damage done to his soil and his crops by the use of heavy farm equipment.

And the general trend towards larger farming units and in some areas larger fields—made possible or desirable, of course, by the development of such agricultural tools as the combine harvester and grain drier.

In America, where much of the aerial spraying and dusting is carried out by "one man and his aircraft" outfits, the accident rate is alarmingly high, and the claims for damage to crops are somewhat forbidding. In England, however, most of the spraying has been carried out by a few substantial firms employing their pilots all the year around on a variety of crops in different countries. Pilots who pioneered the first attempts at spraying in England still are actively engaged on the job, and I know of only two fatal crashes in British crop spraying. Our record is good and the quality of the workmanship is improving.

Opinions vary, but it usually is true to say that it takes one season's work to make a good pilot into a good spray-pilot. This is not altogether surprising. A man who is flying a light airplane some 5 to 12 feet above a crop at 40 to 80 miles per hour has a full-time job just flying. He must sense air movement through the controls, listen to his engine, check the airspeed, keep one eye on fixed obstacles such as trees and overhead wires and the other eye open for moving objects such as birds and other aircraft. These things are vital to his survival, and he has several important gauges to check at intervals—spray pressure gauge, tank contents gauge, oil pressure gauge, fuel level, and so forth.

It is always dangerous to generalize about human beings, but it often is found that good pilots are very much individualists. They naturally are suspicious of anyone who tries to tell them anything about flying, but, in our experience, they are keen to learn anything about agriculture that throws light on their job; particularly concerning the results achieved by using agricultural chemicals. They are not the sort of people who like to be lectured to, but prefer to pick up information in their own way and as the need arises.

Like all individualists, they are not naturally good team workers and it can be a trying job organizing a team of pilots, engineers and ancillary staff on a new operation. There is no traditional or cut and dried method for planning aircraft operations. Each job brings up its own problems and each terrain has its peculiar difficulties.

The pilot may have to be an individualist, but the men working on the ground have to be a good team and always must regard the pilot as part of their team. While the aircraft is spraying, log sheets have to be filled in, refueling requirements anticipated, and spray chemical gotten ready. Filling has to be completed without mess or danger while the engine of the aircraft is running, and, with helicopters, it is usual to keep the time from touch-down to take-off below two minutes. For each man licensed to fly, it is necessary to have two men on the ground. If the markers and tanker drivers also are included, this figure is nearer four.

In England, aerial application is highly seasonal and requirements vary from year to year. As a global operation, however, the work carries on throughout the year and may also include fertilizer top-dressing, anti-mosquito and locust swarm spotting, survey work, carrying oil-drilling equipment, and so on. In England, the work

(Continued on Page 95)

From a talk presented at the eighth national Power Farming Conference, Harrogate, England, Feb. 10-12, 1959.

Continuous Studies Offer Safety For Applicators

by Ralph F. Glasser

Agricultural Chemicals Division
Shell Chemical Corporation
New York

MAN and the insects have much in common, besides a fondness for the same foods. Some of the enzyme systems that keep each alive are basically the same, — and herein lies a problem.

Some of man's most effective weapons against insects do their lethal work by upsetting the operation of some of the commonly held enzyme systems. Thus, these weapons — like a rifle — can harm the hunter as well as the prey, if the hunter gets careless.

One of the goals of the manufacturers of agricultural pesticides is to reduce the opportunity for carelessness to the order of the foolhardy. Their success so far (they have one of the finest safety records of any industry in the country) can be credited to extensive research projects on the safe handling and application of chemicals.

As soon as a chemical shows a potential for controlling insects (or weeds), tests are begun to determine its toxicity against both insects and mammals. In the early mammalian studies, varying doses of the material are fed to laboratory animals. Such studies help scientists establish the lethal level, if any, of the chemical.

In the second stage of the toxicity tests, scientists look for any insidious effect of the substance. For a period of from one to two years, test animals are fed sublethal amounts of the chemical, then killed. Their organs are checked for any sign of deterioration. At the same time, skin contact and inhalation studies are run with other animals.

While these tests are going on, agricultural scientists study the effect of the chemical in the field. They check its effectiveness against specific insects, and its action on a crop and in the soil. Part of this work concerns residues.

Eventually, the information from all these studies answers three questions: How much chemical is required for insect control? How long does it take for this amount to dissipate to a safe level on a given crop? What is the safe level for this particular substance? The answers to these questions indicate the application procedure (the amount of chemical that can be applied at what time) best designed to protect crops and insure food proper for the consuming public.

This is a tough and comprehensive testing program. The National Agricultural Chemicals Association says, "No product in the world today, not even pharmaceuticals, are more thoroughly tested." And all of this testing is done before the product is put on the market. Beyond this stage, testing continues in order to uncover any new toxicological information that may modify previous concepts. Finally, continued observation of exposed persons never stops, so that protection of workers, formulators, and consumers may be assured.

Recently Shell Chemical Corp. added a further test to its program. It's a technique developed by the U.S. Public Health Service to investigate the exposure hazards to people applying phosphates. We used it initially with Phosdrin.

Shell ran the tests to find the best protective garb for the applicator. To get this information, obviously, we had to determine which areas of his body received the highest exposure to the chemical.

The applicator was dressed in coveralls and wore respiratory equipment and goggles. Then we taped 4 ×4 inch gauze pads on the top of his head, his shoulders, the back of his neck, the small of his back, his chest, forearms, hands and thighs. With the patches applied, he then went through the normal routine of applying the insecticide.

After the application, we removed the patches and the filters from his respirator, sealed them in containers and shipped them to our analytical laboratory, where they were analyzed for their Phosdrin content.

From these studies we were able to design the best protective garb for the applicator.

To help insure the safety of applicators, Shell, like most manufacturers, prepares literature on precautions and hazards. Such literature describes the chemical and the protective methods required in using it: how to eliminate contamination . . . prevent inhalation and contact . . . and how to clean up after an application is made. The material also includes details of first aid treatment and a description of the warning symptoms.

If we wish to preserve and improve the safety records of the agricultural chemicals industry, the formulator and applicator of chemicals must take advantage of this knowledge. As in all other cases involving potential hazard, there is no better safety insurance than a safety-conscious operator.★★

A Comparison of Air-Blast and Fixed-Boom Sprayers

An air-blast sprayer, such as this, should provide as good control of most row-crop diseases as the more widely used fixed-boom sprayer, Federal-State scientists believe. Conclusion was made following tests of both types of sprayers to control late blight and anthracnose infections of tomatoes.

AN air-blast sprayer used properly should permit as good control of most row-crop diseases as the more widely used fixed-boom sprayer, according to USDA and state scientists.

This was concluded after equally excellent results were obtained in comparing the efficiency of an experimental air-blast sprayer and a standard commercial fixed-boom hydraulic sprayer to apply the fungicide, Maneb, on different plots of tomatoes. The tomatoes were severely infected with late blight and anthracnose fruit rot.

Dr. John D. Wilson of the Ohio Agricultural Experiment Station and Frank Irons of USDA's Agricultural Research Service conducted the tests last season at Wooster, Ohio. Almost 100 per cent of late blight and some 80 per cent of anthracnose infections were controlled by Maneb applied with either type of sprayer. Treatments were made every eight days from July 18 to Sept. 18.

The air-blast sprayer treated swaths of 12 tomato rows, each six feet apart. First one side, and then the other, of each 72-foot swath was sprayed. Percentages of disease control near the center of each swath were slightly less favorable than at the edges, indicating that air-blasting of still wider swaths would be unsatisfactory.

Air-blast sprays of Maneb were equally effective at the 3-pound-per-acre rate in 10, 20, and 40 gallons of water. Pump pressure was 60 p.s.i., and the force of the air pattern was distributed to avoid plant damage. The fixed-boom sprayer applied three pounds of Maneb in 160 gallons of water per acre at a pressure of 300 p.s.i.

The scientists caution against air-blasting if wind velocity exceeds 10 to 12 m.p.h. They recommend sufficient spray material and air pressure to cover the plants well.

3 or 2?

Diamond's six-pound killers give you the answer!

LINE RIDER herbicides are now available in SIX-POUND acid equivalent low-volatile emulsifiable and oil soluble concentrates. Two gallons of these six-pound formulations contain as much acid equivalent as three gallons of four-pound concentrates.

You save on freight. You save on truck space. You save on storage. You save on handling and field application. All of these add up to savings in money.

Write for details. Diamond Alkali Company, 300 Union Commerce Bldg., Cleveland 14, Ohio.

Diamond Chemicals

Dust Protection your workers will welcome and wear in even the HOTTEST weather

FLEX-A-FOAM Dust Masks

- **Ideal for Hot Weather.** Filter's porous action absorbs and actually exhales body heat.
- Flex-A-Foam's lightweight (only 1 ounce complete) makes it cool and comfortable to wear — not hot and cumbersome like old-fashioned respirators.
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UNMATCHED ECONOMY

Flex-A-Foam is the lowest priced quality respirator on the market today.

Flex-A-Foam's washable filter outlasts throw-away type by more than 100 to 1.

Fewer filter replacements with Flex-A-Foam Dust Masks mean fewer lost production hours.

Your best Ounce of Protection against Irritating Dust

Sample only $1.45 postpaid (Industrial price only)

FLEX-A-FOAM DUST MASK ®

FLEXO PRODUCTS, INC.• Westlake, Ohio

Dr. August Raspet, head of Mississippi State's Department of Aerophysics (foreground with back to camera) gives members of the Mississippi Aerial Applicators Association details of the day's activities.

100 Mississippi Applicators View Aerial Demonstration

by Bob Moulder
Mississippi State University

APPROXIMATELY 100 members and friends of the Mississippi Aerial Applicators Association had a chance recently at Mississippi State University to witness three of the leading applicator planes in action on simulated spray courses.

Under the direction of Dr. August Raspet, director of the Department of Aerophysics at Mississippi State, visitors saw demonstrations of Piper's new Pawnee agricultural aircraft, the new Call-Air, exhibited by Ed Collard of Clarksdale, and Dr. Raspet's new, improved Stearman.

Other demonstrations included a showing of a low-pressure, blower-type dispensing unit for agricultural aircraft which is being developed at Mississippi State through research by the Aerophysics Department.

This blower unit, according to Dr. Raspet, is able to spread either chemicals or seed in a much wider range than the wingtips of the planes. Dr. Raspet said the machine is operated by pressure from the engine and actually blows the chemicals or seed in a wider path.

During the demonstrations, the following averages were shown by the three planes flying over a 2,000 foot straight course: Piper's Pawnee, 37 seconds in the turn and nine seconds on the straightway; the Call-Air was 27 seconds in the turn and 12 seconds working time; and Dr. Raspet's improved stearman operated in 37 seconds on the turn and seven seconds working time.

"The data received was not well enough controlled as to even loading, horsepower, pilot skill, etc., to enable user to select the best airplane," Dr. Raspet said. "But the data did show that the efficiency of applicating is strongly influenced by the time required to turn."

During the tests, many of the visiting pilots were able to test fly the improved Stearman. In addition to MAAA members and their guests, there were people from the U.S.D.A., various departments of the university, and other State offices.

Some of the guests included Dr. Marvin Merkel of the Stoneville Experiment Station; Dean Clay Lyle of the School of Agriculture at Mississippi State University; Frank Wignall from Jackson (FAA); Bud Moore of Jack-

(*Continued on Page* 89)

Starkville, Mississippi's Mayor Hayden Reynolds, (second from left) welcomes Ed Collard of Call-Air and Cy Emery, president of the Mississippi Aerial Applicators Association, to the city.

Dr. Clay Lyle, dean of the MSU School of Agriculture, (left) talks to Fred Weick, director of research for the Piper Aircraft Corp., (center) and Dr. August Raspet. They are in front of the Piper "Pawnee."

LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, United States Department of Agriculture, Beltsville, Maryland.

Some Experimental Compounds for the Control of Asparagus Rust

HARRY H. Murakishi*, of Michigan State University, reports results of tests of some experimental fungicides for control of asparagus rust, caused by the fungus *Puccinia asparagi,* and further trials to compare effectiveness of the most promising materials with that of zineb as a standard.

FIELD SCREENING TRIALS IN 1957

Seven experimental compounds were used to spray plants of the Viking variety in the preliminary tests on the Southwest Michigan Experimental farm at Sodus in 1957. Each treatment row of 20 plants was replicated four times with two guard rows between. Plants were 18 inches apart in the rows, with 4 feet between rows. After harvest during the first week in May, the plants were allowed to grow. Rust appeared the first week in August. A 3-gallon hand pressure sprayer was used for the two applications of each of the compounds being tested, the first application being made on August 14 and the second on August 23. To cover both sides of a treatment row to the point of run-off required about half a gallon of spray mixture. Rather high concentrations of all the materials were used, since the primary aim of the test was to obtain maximum control of the rust with two applications. Treatments were rated September 13 on the basis of amount of rust infection on the stem, according to a scale ranging from 0, no infection, up to 10, very heavy infection. Effect of each compound on the foliage was also noted.

Of the seven compounds given this preliminary screening, Acti-dione-S (semicarbazone analog of cycloheximide; Upjohn Co.) provided best control of rust. D-113 (1,2,dichloro 1-methyl sulfanyl ethylene; Chemagro Corp.) was next in effectiveness. The first application of Acti-dione-S, at 200 parts per million (ppm) of active ingredient, resulted in slight to moderate injury from which the plants soon recovered. The second application, at 100 ppm, caused no injury. D-113 and the other materials tested were used at the rate of 1250 ppm in both applications.

The mean infection indexes for plants sprayed with Acti-dione-S and D-113 were 0.48 and 1.44, respectively, compared with indexes ranging from 1.59 up to 2.66 for the other treatments, and 3.71 for unsprayed plants. Plants sprayed with Acti-dione-S and with D-113 remained greener and retained more foliage at the end of the test than plants sprayed with the other materials. The other compounds were more toxic as well as less effective than these two.

COMPARISON WITH ZINEB IN 1958

Asparagus rust can be controlled successfully with zineb, as has been shown both experimentally and in actual field use. Reports cited by Dr. Marakishi indicate that the minimum number of applications of zineb is six, while eight gives superior control.

In 1958, further trials were made at Sodus and East Lansing, to compare effectiveness of Acti-dione-S and D-113 applied twice with that of zineb applied six times.

The 1958 experiment at Sodus, again on the variety Viking, was similar to that of the preceding year. Harvest was during the last week of April and the first two weeks of May. Rust appeared about the end of July. Parzate (65% zineb; E. I. du Pont de Nemours Company), 2 pounds to 100 gallons, was applied every 7 to 10 days from August 5 to September 15. Acti-dione-S, 100 ppm, and D-113, 1250 ppm, were applied on August 5 and 14. Spray equipment and amount of spray mixture used were as in the 1957 trials. Ratings on October 10 gave mean infection indexes as follows: Parzate 0.73; Acti-dione-S 1.73; D-113 2.91; control (not sprayed) 4.40.

The experimental field at East Lansing was not harvested. Rust appeared during the week of July 21. Instead of a hand pressure sprayer, a 15-gallon power

(Continued on Page 91)

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*Harry H. Murakishi, "The efficacy of certain systemic compounds in the control of asparagus rust," *Plant Disease Reporter,* vol. 43, no. 5, pages 552-555. May 15, 1959.

Aviation Firms Merge

The Agricultural Aviation Engineering Co. and Pickell and Associates have merged under the corporate structure of the Agricultural Aviation Engineering Co., engineering research and design specialists in the field of agricultural and industrial aviation. Pickell manufactures and develops agricultural aircraft components.

Phillip R. Pickell has been appointed operations manager and George S. Sanders is engineering and administrative manager of the company. Now occupying offices in Sunnyvale, Calif., the company will consolidate its operations in Santa Clara, Calif., near the San Jose Airport.

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USDA Clears Label

A label clearance by the USDA will allow the application of Toxaphene to land being grazed by meat animals and will permit animals to be treated with Toxaphene formulations.

Super Marsh Buggy

The Hoover Amphibious Swamp and Canal Sprayer, designed for clearing vegetation to improve drainage in remote swamps and bayous of Louisiana lowlands, has been developed by the Hoover Machine Shop in Ponchatoula, La.

With an over-all length of 26 feet, it weighs 12,000 pounds empty, and carries a 6,000 pound payload of water and chemicals. The machine floats in deep water, crawls through mud, and rolls freely on a hard surface.

Its first successful operation was in 1957, when 60 miles of canals and ditches were sprayed. In 1958, 90 miles of canals and ditches were sprayed from the Hoover sprayer. With a three-man crew, the machine covered three to five miles per day. A ten-man crew had averaged half a mile per day.

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Safety Slogan Contest

The Agricultural Aircraft Association, Fresno, Calif., is sponsoring a contest to find a safety slogan for the California agricultural aviation industry. The contest, which closes Sept. 1, is open to residents of California who are connected with the industry in some way. The prize for the winner is a free weekend for two in Las Vegas, Nevada.

Now American Airmotive

In an article about the NA-75 Stearman on Page 57 of our July, '59 issue, we listed the National Aircraft Corp. as the manufacturer. That company, however, now is the National Aircraft Division of the American Airmotive Corp., Miami, Fla.

American Airmotive Corp. offers the complete NA-75 airplane and also offers the wings and center section separately for use on existing Stearman airplanes. A complete combination dust-spray dispersal system also can be purchased from American Airmotive.

CallAir

Agricultural Airplane

Why CALLAIR is the world's best crop duster and sprayer

SAFETY

ECONOMY

COMFORT

The CALLAIR is specifically designed to do one job — agricultural flying. It's designed and built by men who know agricultural flying — and that means with every safety and economy feature built right in. See for yourself.

THE SAFEST AGRICULTURAL AIRPLANE EVER BUILT

CallAir
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PEST ROUNDUP

By Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

European Corn Borer Active in Eastern States

BY the latter part of June, European corn borer populations were very high in both sweet and field corn of all Delaware counties. Fourth and fifth-instars larvae were very common and tunnelling in corn stalks was noticeable. Damage to corn by the borer was very heavy in several fields in Prince Edward County, Virginia. Wheat was damaged in several Virginia counties, with Lancaster county having damage to some extent in practically all fields. Populations were heavy in wheat in Talbot, Frederick and Prince Georges counties, Md. Field corn infestations ranged up to moderate on the Maryland Eastern Shore, but whorl and tassel infestations in sweet corn in Talbot and Queen Annes counties averaged 20-30 per cent. Untreated sweet corn in Cape May county, N.J., had European corn borer damage, whereas treated fields were quite clean with only light tassel damage.

European corn borer populations continued light throughout June in most of the middle western states. Cool weather delayed adult emergence in Ohio, and populations were generally low throughout Indiana. Few moths were appearing in Wisconsin by the latter part of June, and egg masses averaged 4 per 100 plants in Dane county. Egg masses averaged 4 per 100 plants in Union county, S.D., and 8 per 100 plants in Clay county. Peak oviposition in the state was expected early in July. Adult flights were much lighter in Lincoln county, Neb., than in 1958. Emergence was 100 per cent complete and egg masses ranged from two to over 200 per 100 plants.

Egg mass counts in northwest Missouri ranged from 0-6 per 100 plants, with plants showing feeding damage ranging from 0-65 per cent in the west and central areas of the state. In Riley county, Kansas, up to 75 per cent of the corn plants were infested. Populations of the European corn borer were not sufficiently high in Illinois to warrant control in field corn. In some cases, seed and sweet corn required treatment. The heaviest egg mass counts in Illinois, 100 per 100 stalks, were in the northeast, with the lowest count being 18 in the eastern part of the state.

In Illinois, however, it was not the European corn borer that was causing the most concern. The insect which had, by the latter part of June, caused the most trouble in the state was the black cutworm. Although the cutworm outbreak was reported throughout the state, with average losses in infested fields ranging from 15-50 per cent, the most severe damage to late planted corn probably occurred in the southeastern area. Corn in two townships of one county was either destroyed completely, or at least the stand was severely reduced.

The alfalfa weevil is now in Alabama. Larvae of this insect were collected in April from alfalfa in Houston county where extensive damage occurred. First collections of the insect in Tennessee were reported from Johnson and Sullivan counties in late May. Although the insect does not appear to be doing as much damage in the east as in past years, some western states reported serious damage. During the latter part of June the weevil was very heavy in the upper Arkansas Valley of Colorado. The pest is relatively new to that part of Colorado and growers are not aware of the seriousness of the problem. Three years ago, the insect was found in a field near Rocky Ford and has now spread generally throughout the valley. In late June, alfalfa weevil larvae averaged 10 per sweep in unsprayed alfalfa in Crook county, Wyo., and damage was 30 per cent. Platte county reported some damage, but little was reported from other counties checked. One field in Caribou county, Idaho, showed severe damage, while injury was beginning to show in many Bingham and Powers counties fields.

Cotton Insects

IN general, the cotton boll weevil was light by late June. Hot, dry weather in the Florence, S.C., area curtailed activity. Although squares were punctured generally through the area, untreated fields showed only 13 per cent punctured squares; treated fields, 4 per cent.

(Continued on Page 89)

WASHINGTON REPORT

By Donald Lerch

U. S. Fish and Wildlife Service is running into some opposition in its effort to gain additional funds for pesticide and wildlife research. Congress has voted the agency $280,000 for this research in fiscal 1960. But already bills H. R. 5813 and S. 1575 have been introduced to raise this amount ten times — to $2,565,000 a year — for 1961 and beyond.

Chances that the agency will get Congressional authorization for any sweeping increase of this kind this year or even next year, however, are now being figured here at somewhat less than 50-50. Those looking for indicators of Congressional thinking can find them in two actions already taken. In one, the economy-minded Congress pared over $1 million from amounts requested by U. S. Fish and Wildlife for fiscal 1960. This indicates many Congressmen feel wildlife is an area where economies can be made.

In a more significant move, House and Senate Conferees rejected the broadside attack by certain wildlife conservation groups against the imported fire ant eradication program by including $2.4 million in USDA's 1960 appropriations to continue the program. What makes this move more important is that attacks against the fire ant eradication program played the major role in the publicity build-up to justify the need for additional funds for pesticide and wildlife research.

Failure of wildlife enthusiasts to upset the fire ant eradication program weakens their entire campaign for added pesticide research funds. At the same time, it points up a serious flaw in their entire approach to pesticides and wildlife. Their primary effort has been directed toward proving how much or how litle of a given insecticide would kill a bird or other wildlife under certain circumstances. They have given litle attention to the more significant questions of how correct pesticide use affects overall wildlife populations, either in the short run or in the long run. And no attention at all has been given to other values — some important to increasing wildlife populations —being preserved by the correct use of pesticides.

In Washington, there's a saying that the difference between a "special pleader" and a "statesman" is broadness of vision. Some astute observers feel the time is ripe for a statesman to arise from the ranks of wildlife enthusiasts. Perhaps such a wildlife statesman will see the value of switching the wildlife approach from the negative one of finding out how much it takes to kill a bird or a fish, to the positive approach of finding out what more needs to be done to assure our people of a continuing adequate supply of fish and wildlife.

An approach along this line is most likely to gain the wholehearted support of agricultural, forestry, park and roadside maintenance, and public health interests as well as that of hunters, fishermen, and aesthetic wildlife enthusiasts.

The attitude of some leaders here, frankly, is that cooperative research with other agencies of federal and state government would move the wildlife program along farther and faster than a go-it-alone research effort. This would be especially true, if truly major factors affecting wildlife populations such as air and water pollution, the spread of suburbs, factories, airports and highways were made part of the research program.

Interesting to note, Pesticide Industry leaders with whom we checked are in favor of additional cooperative research on the effect of pesticides on wildlife — providing the research serves the broad general welfare.

* * * * *

Fertilizer and pesticide manufacturers are watching trends in U. S. farm income with an eagle eye these days. Despite the upswing in the general economy, agricultural economists are predicting a drop in net income per farm for 1960 and beyond.

On the surface farm economics couldn't look better. Demand for farm products, particularly livestock products, is good. Crop prospects have never been better. U.S. population is rising at a rate of 3 million a year (each person consumes about 1,500 pounds of foods a year).

The one crucial factor spoiling this otherwise sunny picture is that overproduction (or underconsumption) of some key farm food items is threatening price reductions. In some cases expected price reductions are more than any increase in production can overcome.

In the past, especially before World War II, farm income was the major factor in determining

(*Continued on Page* 85)

Arcadian® News

Volume 4 For Manufacturers of Mixed Fertilizers Number 8

HERE ARE 12 WAYS THE PRE-REACTOR PAYS!

MAJOR ADVANTAGES OF NEW TECHNIQUE

The new pre-reactor process for producing high-analysis, high-nitrogen mixed fertilizers is rapidly gaining in popularity because it offers so many outstanding advantages. Here are only a few of the many benefits fertilizer manufacturers obtain by incorporating a pre-reactor in a normal high-analysis manufacturing operation:

1 Low-cost Nitrogen

Produce such grades as 16-8-8, 16-4-8, 15-10-10, 12-12-12, and 14-0-14 with *all* the nitrogen derived at low cost from ARCADIAN® Nitrogen Solutions.

2 Accurate Formulation

Put exactly enough nitrogen into high-analysis fertilizers to meet minimum guarantees, without resorting to excessive formulation.

3 Less Loss of Nitrogen

Manufacture high-quality granular fertilizers with a recovery of 97 to 98% of nitrogen input.

4 Efficient Use of Acids

Neutralize ammoniating solutions with sulfuric acid, without using the excess amounts of acid often needed in conventional equipment. Provide more intimate contact of phosphoric acid with ammoniating solution.

5 Better Ammoniation

Get high ammoniation rates by ammoniating dry superphosphate before combining with nitrogen slurry from pre-reactor.

6 Savings in Handling

Eliminate costs of handling dry materials and unavoidable losses of these materials in manufacturing fertilizers.

7 Greater Precision

Gain efficiency and safety by precision control even at maximum ammoniation rates. Maintain effluent at the temperature, physical condition and moisture content desired for best results.

8 Improved Performance

Produce low-moisture, quality-controlled slurry that mixes easily with other fertilizer ingredients for better granulation and reduced re-cycle.

9 Fuel Savings

Use chemical heat of pre-reactor to produce hot, relatively dry slurry, reducing the need for fuel for further moisture reduction of mixed goods in dryer.

10 Fume and Dust Reduction

Minimize the expensive and wasteful nuisance of fumes and dusts usually encountered with conventional systems.

(Continued on next page)

(Continued from preceding page)

11 Simplified Solution Selection

Select and use only one ARCADIAN® Nitrogen Solution for year-round production of a great variety of fertilizer analyses.

12 More Space for Mixed Goods

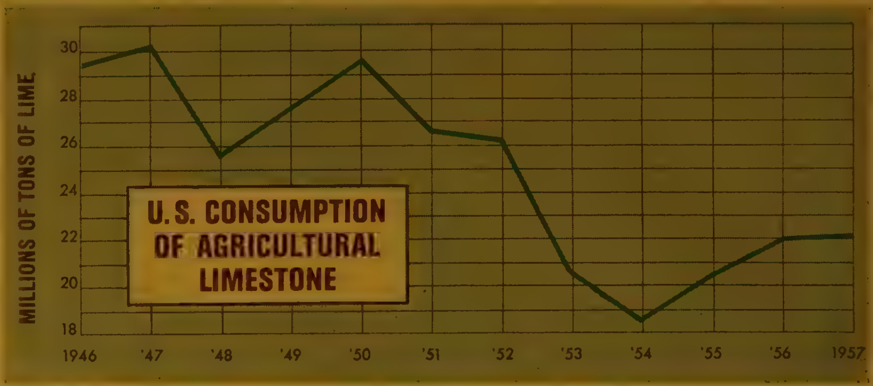
Use storage space for mixed goods rather than solid nitrogen materials. No storage space is needed for solid nitrogen for manufacturing mixed fertilizers when *all* the nitrogen is obtained from ARCADIAN Nitrogen Solutions.

Call Nitrogen Division

Listed above are only a few of the reasons why fertilizer manufacturers are finding that it pays to install and use the pre-reactor. If you are interested in producing high-analysis fertilizers in 2-1-1, 3-2-2, 1-1-1 and 1-0-1 ratios, it will pay you to investigate this new and different technique. You will discover you can make great gains in economy, efficiency, safety, volume, quality, and extra profits!

There is nothing complicated about adding a pre-reactor to your present set-up for manufacturing high-analysis fertilizers. The same standard equipment is used . . . nothing is eliminated. For complete details, contact Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y. Telephone: HAnover 2-7300.

Many soils need lime to make fertilizer pay. Sell lime to sell more fertilizer!



SELL LIME NOW!

Fertilizer cannot produce maximum returns on soil which is too acid for the particular crop. In fact, soil acidity can reduce the effects of fertilizer in many instances. It will pay you to urge farmers to test their soils and apply the full amount of lime that is needed for best crop results. This increases the farmers' yields and profits and helps to increase your sales and profits.

Lime can bring the soil to the proper pH level for the crop. In addition, the calcium in lime is an essential plant food. Lime also reduces the leaching of fertilizer. And, lime increases availability of phosphorus, molybdenum and certain other elements essential to crop growth.

Most soils in humid areas need lime to reduce soil acidity for major crops. This acid area includes all the territory east of a line from the Red River of Minnesota through eastern Nebraska down through central Texas.

The amount of lime needed per acre, however, varies greatly from farm to farm, from field to field, and even in various parts of the same field. Soil tests will quickly determine the quantity of lime to use.

For best crop yields, farmers should be using at least 80 million tons of limestone per year. But they are far short of that. In Georgia, for example, the 300,000 tons of lime applied in one year is a small fraction of the 1,700,000 tons needed. In Missouri, one-third of the cropland, previously limed, still needs lime, and about half of the pastureland, previously limed, still needs lime. Most cropland in the humid area needs at least one ton of lime every four years. Some acid clay soils require six or eight tons of lime at the start.

The calcium in lime is an important plant food. A 4-ton alfalfa crop removes 100 pounds of calcium from the soil. That's equivalent to 560 pounds of good quality crushed limestone. A ton of cornstalks contains 10 pounds of calcium and a ton of bromegrass, 8 pounds.

When soil acidity causes poor crops, farmers often blame the fertilizers they use. In acid soils, soil bacterial action is retarded. This slows down release of plant foods from organic matter and speeds leaching of fertilizer.

But the biggest disadvantage of soil acidity is its effect of denying phosphorus to plants. This cripples fertilizer's ability to produce profitable yields. In typical acid soils, highly-soluble phosphates are rapidly fixed in the soil by iron and aluminum into compounds from which crops can get little or no phosphorus plant food.

Liming helps liberate some fixed phosphorus in the soil, and also prolongs the availability of phosphates applied in fertilizer. Research indicates that the highest availability for most forms of phosphorus occurs when soils are limed enough to reduce acidity to a pH between 6 and 7.

Long-term crop yields demonstrate the lasting benefit of liming acid soils. In a 12-year Wisconsin test, lime boosted corn yields 14 bushels per acre per year, and hay yields half a ton per acre per year. With lime *and* fertilizer, the yield increase was two to four times greater. In a 4-year Illinois test, lime raised crop value $18.50 per acre per year.

Spreading lime with dealer trucks helps your fertilizer pay off for farmers. Legumes need lime in the surface soil at planting time. For most other crops, you can lime at any convenient time, before or after plowing. Late summer, with dry, firm ground, is an excellent off-season time for spreading lime on hayland, pastures and small-grain stubble. Fall, after harvest, is a good season for liming row-crop land or meadows.

Arcadian® News *for Fertilizer Manufacturers . . . . from* NITROGEN DIVISION

Outdoor living is a big booming trend in America today. Right now, millions of families are outdoors, walking on a tremendous fertilizer market available to you . . . GRASS.

This market is as near as your neighbor's lawn. It extends as far as the nation's sprawling suburbs, parkland and interstate highway systems. More than 14 million acres of turf present an inviting market for high-nitrogen fertilizers.

Fine healthy turf is desired for parks, playgrounds, golf courses, cemeteries, and airports. Factories and offices are landscaped in grass. Millions of miles of highways are banked by grass.

By far the largest grass area surrounds modern homes. Home-owners take pride in attractive lawns. Turf experts estimate that for every million homes built each year, there is an additional 100,000 acres of new lawn added.

Each year 1½ million acres go out of farming to become homes, roads, factories and recreational areas. Most of this area is planted to grass.

Turf experts call grass "America's most valuable crop." They point out that more money is spent for grass than for any other single crop. And remember, there are no crop surpluses to worry about . . . no acreage allotments . . . no government restrictions on the growth of grass for beautifying the landscape.

Consider a recent survey that indicates approximately 140 million bags of lawn and garden fertilizer in packages of 20 pounds and more were sold during 1958. The survey noted that only 50% of home-owners are actually buying fertilizer.

Present customers often could use more. Non-buyers certainly need to be sold. All customers are potentially repeat buyers; once, twice, even three times each year to keep their lawns and gardens growing well.

Turf experts, garden editors and landscape authorities are advocating high-nitrogen fertilizers for grass. They recommend such grades as 2-1-1, 4-2-1, 3-1-1, 3-2-1 and similar high-nitrogen fertilizers. More important to your formulating plans, these experts are advising that fertilizers for lawns and ornamentals contain long-lasting nitrogen.

Home-owners want attractive lawns. They want fertilizer that is easy-to-use, safe-to-handle; that doesn't burn lawns and plants. Most of all they want to see quick results and uniform green growth. High-nitrogen fertilizers, containing a large proportion of slow-release ureaform nitrogen, are in demand.

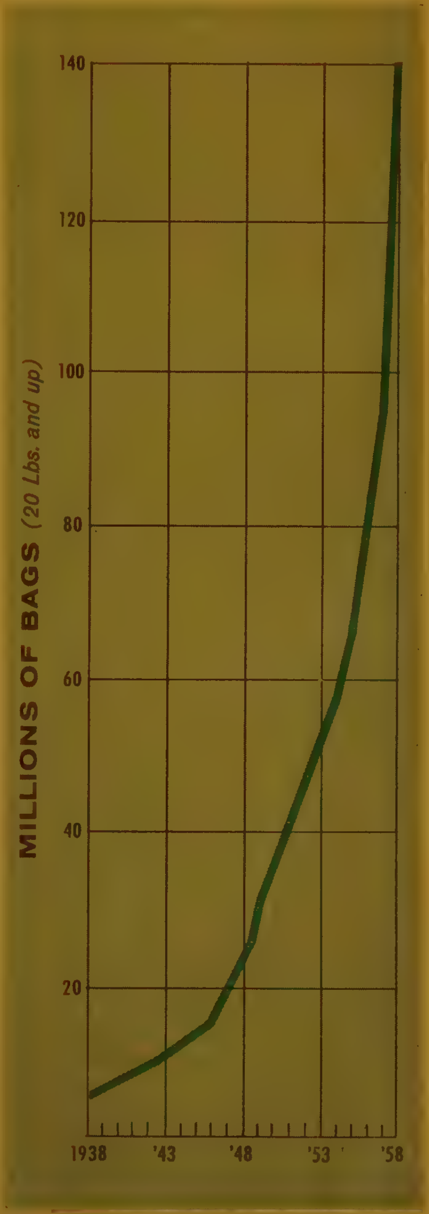
Nitrogen Division research has perfected the process of using N-dure® and urea for manufacturing fertilizers that supply nitrogen to plants at a uniform rate. You can manufacture these popular high-nitrogen fertilizers easily with N-dure, at economical cost.

With N-dure, you can easily make semi-granular, non-segregating, non-burning mixed fertilizers in a variety of popular high-nitrogen combinations. Modern mixed fertilizer that is dustless, easily-applied, safe-to-use, and gives quick growth plus enduring results is in growing demand.

It is estimated that by 1962, over 200 million bags of fertilizer will be bought by non-farm consumers. This vast market is being tapped through garden centers, hardware stores, department stores, food markets and shopping centers.

Find out how easy it is to use N-dure to make your own ureaform nitrogen while blending your mixed fertilizers. Demand for plant food with enduring nitrogen is booming. Start your profit-making specialty fertilizer program now!

A Nitrogen Division technical representative can show you how simple it is to fit N-dure into your production. Contact Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y. Telephone HAnover 2-7300.



Sales of non-farm speciality fertilizers are going up fast—a big market for you!

HERE'S THE BIG LINE OF

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

Arcadian NITROGEN SOLUTIONS

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60° F	Approx. Vap. Press. at 104° F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

Other ARCADIAN® Products: URAN® and FERAN® Solutions • Ammonia Liquor • N-dure® A-N-L® • Ammonium Nitrate • UREA 45 • Nitrate of Soda • Sulphate of Ammonia

NITROGEN DIVISION

Allied Chemical

MAIN OFFICE: 40 RECTOR ST., NEW YORK 6, N. Y., PHONE HANOVER 2-7300

Hopewell, Va., P. O. Drawer 131 .... Glenview 8-6301
Ironton, Ohio, P. O. Box 98 .... Drexel 7-4366
Omaha 7, Neb., P. O. Box 166 .... Bellevue 1464
Raleigh, N. C., 16 W. Martin St. .... Temple 3-2801
Columbia 1, S. C., 1203 Gervais St. Alpine 3-6676
Atlanta 3, Ga., 127 Peachtree St., N. E. Jackson 2-7805
Memphis 9, Tenn., 1929-B South 3rd St. Whitehall 8-2692
Columbia, Mo., 1134 Highway 40W ...... Gibson 2-4040
Indianapolis 20, Ind., 6060 College Ave. Clifford 5-5443
Kalamazoo, Mich., P. O. Box 869 Kalamazoo 5-8676
St. Paul 14, Minn., 764 Vandalia St. Midway 5-9141
San Francisco 4, Cal., 235 Montgomery St. Yukon 2-6840

Allied Revamps Top Posts

The Allied Chemical Corp., New York, has announced changes at the top executive level, with the chairman now designated as the chief executive officer. Previously the president had been the chief executive officer. The changes become effective in September when Glen B. Miller, president, reaches the normal retirement age of 65.

Under the realignment, Kerby H. Fisk, chairman of the board will be chief executive officer. Harry S. Ferguson will become chairman of the executive committee and chief administrative officer. He is an executive vice president.

Chester M. Brown will be president and chief operating officer. He is a vice president of the corporation and president of the National Aniline division. He formerly was president of the General Chemical division.

Bennett Elects Officers

Bennett Industries, Inc., Peotone, Ill., manufacturers of steel pails and drums and fibre drums, has announced the election of company officers. A. J. Gasbarra, executive vice president, has been elected a director and L. A. Istel has been elected vice president and assistant general manager.

Also, W. R. Chapman was named vice president and general manager of the structural division and R. R. Ernst is vice president and sales manager of the container division.

Canadian Nitrogen Plant

Sogemines Ltd., a Canadian company affiliated with Societe Generale de Belqique (Brussels), plans to build a nitrogen plant at Maitland, Ontario. The plant is expected to put the country's nitrogen capacity above anticipated domestic demand. Canada has been a big synthetic nitrogen importer.

Output of the new plant will include ammonium nitrate, nitrogen solutions, anhydrous ammonia, and hydrogen. Most of the anhydrous ammonia and hydrogen will be sold to the nearby Maitland Works of Du Pont of Canada. Sogemines intends to sell the other products in eastern Canada, eastern New York, and in New England.

Pest Control Team To USSR

The U. S. Department of Agriculture last month announced the departure of an agricultural observation team for the Soviet Union under the government's scientific and technical exchange agreement with the USSR.

The team's purpose will be to gather technical information regarding biological control of pests. Among the members of the team are: Lev F. Curl, plant pest control division, ARS, Washington; Herbert L. J. Haller, ARS, Washington; John B. Osmun, Department of Entomology, Purdue University; Halbert M. Harris, Department of Zoology and Entomology, Iowa State University; and Carl B. Huffaker, University of California.

Kentucky Fertilizer Conf.

The annual Kentucky Fertilizer Conference, held in Lexington, July 29, featured talks by T. H. Taylor, crops agronomist, U. of Kentucky, who discussed recent research concerning pasture renovation, and E. C. Doll, a soils agronomist. Mr. Doll presented results obtained by research on the effects of proper fertilization on pasture yields and the effects of different fertilizer mixtures on grass-legume pastures.

Zenas Beers, Midwest Director for the National Plant Food Institute, discussed the NPFI program for Kentucky and told how it will affect future agricultural production in the state. G. W. Schneider, head of the U. of Kentucky horticulture department, listed some problems associated with fertilization of certain horticultural crops.

Ireland Fertilizer Plant

W. & H. M. Goulding Ltd., an English fertilizer manufacturing firm, has appointed Simon-Carves Ltd. (England) as main contractors for the design and construction of the final development of Goulding's Marina Works at Cork, Ireland.

The new Marina Works development is comprised of a sulfur-burning, contact-type sulfuric acid plant (the first in Eire), and plants to produce single and triple superphosphate and compound fertilizers.

Name U. S. Pyrethrum Agents

The Pyrethrum Board of Kenya and the Societe Cooperative des Produits Agricoles of Goma, Belgian Congo (SOCOPA) have appointed exclusive representatives for the sales of pyrethrum extract in the United States.

The firm named by SOCOPA as U.S. representative is Biddle Sawyer, Corp., New York.

Balfour, Guthrie & Co., Ltd., represents the Pyrethrum Board of Kenya.

Stepan Begins Construction

The Stepan Chemical Co., Chicago, has started construction on an administration and research center, to be completed next January. The new building, on a 15-acre tract at Research Park in Northfield, Ill., a suburb of Chicago, will make possible the consolidation of the firm's research and development staffs which now are located in the company's various manufacturing plants.

Grace Names Two To Sales

The Grace Chemical Division of W. R. Grace & Co., Baltimore, has appointed P. Paul Lowery and Joseph D. Leeke to its sales staff.

Mr. Lowery is assigned to the Memphis district sales office to cover the states of Texas, Oklahoma, Kansas, and New Mexico.

Mr. Leeke will cover Tennessee, Kentucky, Missouri, and southern Illinois.

Discourage Use of MH-30

The use of MH-30, a growth retardant that prevents tobacco suckering, is being discouraged by the Flue-Cured Tobacco Cooperative Stabilization Corp., Raleigh, N. C.

In the July issue of its monthly news letter, the cooperative corporation said that the use of MH-30 caused many millions of pounds of tobacco to come into its inventory from the 1958 crop which otherwise would have gone into trade channels. When packing this tobacco at the redrying plants, the news letter said, it was necessary to establish special factory grades in order to pack the tobacco uniformly, without penalizing acceptable and useable tobacco. To date, none of the tobacco on which MH-30 had been used has been sold, the statement said.

According to the cooperative, domestic manufacturers did not want tobacco where MH-30 had been used, even though the use of it is not visible on the tobacco. In addition, foreign manufacturers are said to have instructed their tobaco purchasers not to buy tobacco if there was any indication that MH-30 had been used.

◆

Plan Research Center

The Dow Chemical Co. has announced plans to build an agricultural chemical research center at company headquarters in Midland, Mich. Construction is scheduled to begin immediately and completion is scheduled for next summer.

◆

Hooker Opens London Office

A London, England, office has been set up by the Hooker Chemical Corp., Niagara Falls, N. Y. Dr. Basil V. de G. Walden, who has represented Hooker in England, is director of the office.

◆

Offer To Lease Equipment

The Simonsen Manufacturing Co., Quimby, Iowa, is making available, on a lease arrangement, its full line of equipment—including fertilizer spreaders and fertilizer mixer spreaders.

The plan is intended to allow dealers to go into large scale operations without investing heavily in equipment.

◆

Horne Is Sales Manager

Everett C. Horne has been named sales manager of the basic materials department of the new agricultural chemicals division of International Minerals & Chemical Corp., Skokie, Ill.

Mr. Horne, who joined IMC earlier this year, had been manager of fertilizer sales for Bradley & Baker.

The sales organization of the department, which will handle the full line of IMC fertilizer ingredients, will consist of five regional managers and 12 district managers.

The regional managers are: Fred C. Broadway, Atlanta; George J. Urbanis, Indianapolis; Gerd W. Kraemer, Minneapolis; Jack K. Lindsey, Shreveport; and William W. Chadwick, New York.

◆

Fleschner Succeeds Clausen

Dr. Charles A. Fleschner has been named to succeed Curtis P. Clausen as chairman of the University of California's Berkeley-Riverside department of biological control. Professor Clausen has been chairman of the department since 1951. From 1920 to 1951 he was in the U. S. Department of Agriculture's bureau of entomology.

Dr. Fleschner currently is searching for beneficial insects in the Orient.

◆

To Expand Egyptian Company

An Egyptian fertilizer company has been authorized a $5-million loan to finance purchases of equipment in the United States for an expansion of its operations. The loan was authorized for Societe Egyyptienne d'Engrais et d'Industries Chimiques, S.A.E., of Cairo.

The company will enlarge its ammonia production facilities by 50 per cent. Chemical Construction Co., New York, which carried out the engineering design and related studies for the original plant in 1948, is acting as engineer on the expansion program.

Name 13 Mixer-Distributors

The U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corp., New York, has appointed 13 new mixer-distributors of Morea liquid supplement.

This brings the number of mixer-distributors recently appointed in U.S.I. eastern and western sales areas to more than 20. Feed Service Corp., Crete, Nebr., has about 90 Morea liquid supplement mixer-distributors operating in its midwest sales territory. U.S.I. expects that several hunderd will be in business in the combined territories within another year.

◆

General Chemical Names Two

James P. Farrell and J. Steele Brown have been appointed vice-presidents of the General Chemical Division, Allied Chemical Corporation, New York.

Mr. Farrell heads the sales of acids, other industrial chemicals, laboratory reagents and fine chemicals, agricultural chemicals, and special products. Mr. Brown is in charge of the division's purchasing, mining, and industrial service activities.

◆

Meadors Joins Amchem

Cecil H. Meadors has joined Amchem Products, Inc., Ambler, Pa., as a sales development specialist on brush killers for range lands and on special types of weed killers for farms. He will cover Texas and Oklahoma. Mr. Meadors formerly was with the Agricultural Experiment Station in Spur, Texas.

◆

McKay Named To New Post

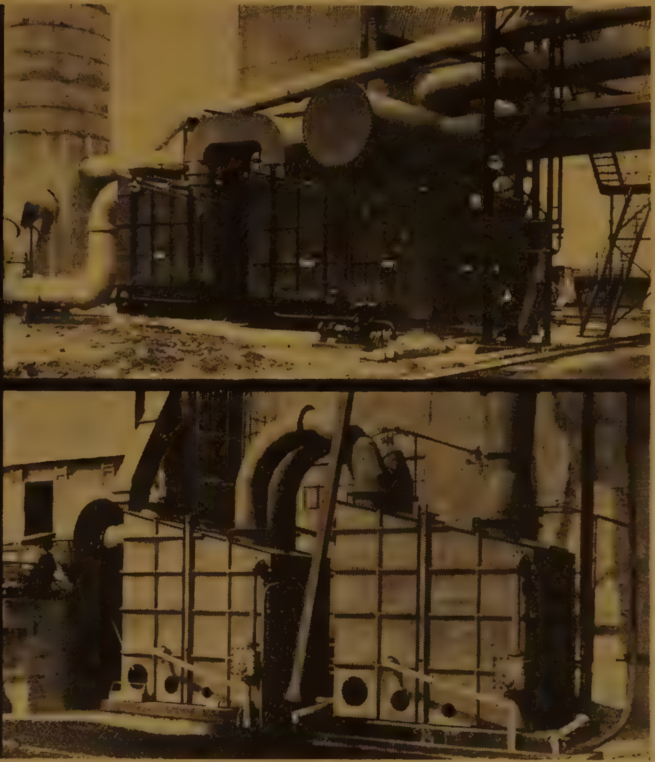
Dr. William McKay has been appointed to the newly-created post of agricultural scientific co-ordinator, European region, for Cyanamid International, a division of the American Cyanamid Co. He previously was head of the advisory department for the agricultural department of Cyanamid of Great Britain, Ltd.

typical fertilizer plant installations prove efficiency of the

DOYLE SCRUBBER

for removal of solids and fumes from gas streams

American Cyanamid Co., Brewster, Fla.



Top photo: Scottish Agricultural Industries, Ltd., Leith, Scotland.
Lower photo: Norske Zinkkompani A/S, Odda, Norway.

- *simple design*
- *high scrubbing efficiency*
- *low water requirements*

The Doyle Scrubber provides a highly efficient yet extremely simple, compact and rugged means for removing solids and fumes from gas streams. It is particularly adapted to fertilizer plant applications, including treatment of waste gases from phosphate fertilizer driers and several other operations. Its versatility is demonstrated in such additional applications as fume control in smelters, treatment of SO_2 gas prior to acid manufacture, ammonia recovery and possible use in fly ash collection.

The Doyle design makes possible high solids concentration in the scrubber effluent, a low water requirement and high heat transfer rates. Its efficiency has been conclusively proved in several installations. Doyle Scrubbers are constructed, sold and installed under license by Dorr-Oliver. They make an important addition to the extensive line of D-O equipment already offered to the fertilizer industry. For full information, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

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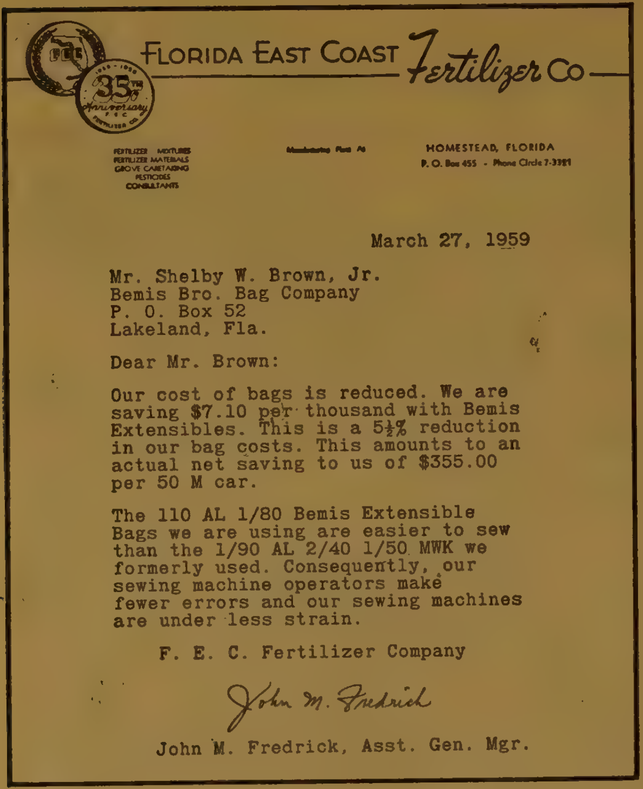
Would you like to decrease your packaging costs?

It's being done . . .

with **BEMIS EXTENSIBLE MULTIWALLS**

Let these three typical experience stories guide you . . .



FLORIDA EAST COAST Fertilizer Co

FERTILIZER MIXTURES
FERTILIZER MATERIALS
GROVE CARETAKING
PESTICIDES
CONSULTANTS

HOMESTEAD, FLORIDA
P. O. Box 455 - Phone Circle 7-3381

March 27, 1959

Mr. Shelby W. Brown, Jr.
Bemis Bro. Bag Company
P. O. Box 52
Lakeland, Fla.

Dear Mr. Brown:

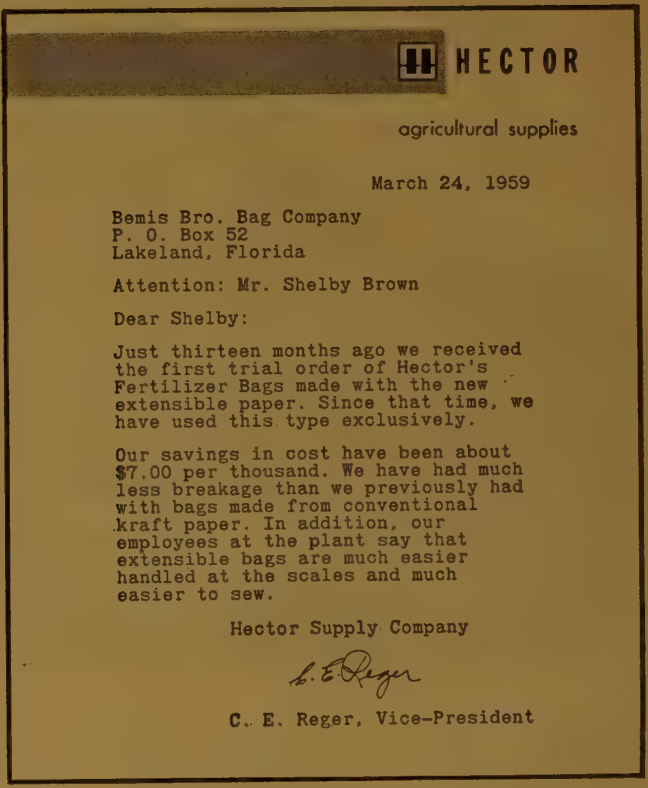
Our cost of bags is reduced. We are saving $7.10 per thousand with Bemis Extensibles. This is a 5½% reduction in our bag costs. This amounts to an actual net saving to us of $355.00 per 50 M car.

The 110 AL 1/80 Bemis Extensible Bags we are using are easier to sew than the 1/90 AL 2/40 1/50 MWK we formerly used. Consequently, our sewing machine operators make fewer errors and our sewing machines are under less strain.

F. E. C. Fertilizer Company

John M. Fredrick

John M. Fredrick, Asst. Gen. Mgr.



HECTOR

agricultural supplies

March 24, 1959

Bemis Bro. Bag Company
P. O. Box 52
Lakeland, Florida

Attention: Mr. Shelby Brown

Dear Shelby:

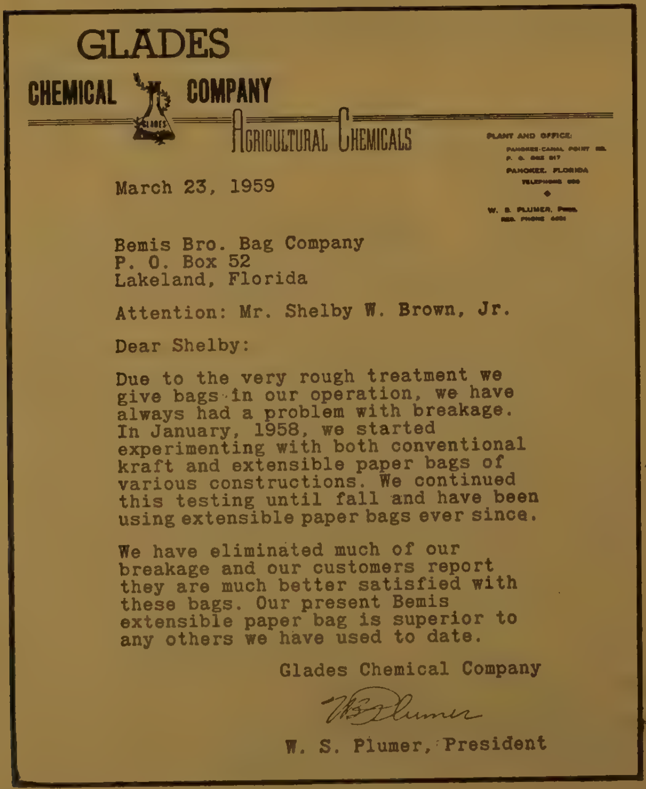
Just thirteen months ago we received the first trial order of Hector's Fertilizer Bags made with the new extensible paper. Since that time, we have used this type exclusively.

Our savings in cost have been about $7.00 per thousand. We have had much less breakage than we previously had with bags made from conventional kraft paper. In addition, our employees at the plant say that extensible bags are much easier handled at the scales and much easier to sew.

Hector Supply Company

C. E. Reger

C. E. Reger, Vice-President



GLADES
CHEMICAL COMPANY
AGRICULTURAL CHEMICALS

PLANT AND OFFICE:
PAHOKEE, FLORIDA
◆
W. S. PLUMER, Pres.

March 23, 1959

Bemis Bro. Bag Company
P. O. Box 52
Lakeland, Florida

Attention: Mr. Shelby W. Brown, Jr.

Dear Shelby:

Due to the very rough treatment we give bags in our operation, we have always had a problem with breakage. In January, 1958, we started experimenting with both conventional kraft and extensible paper bags of various constructions. We continued this testing until fall and have been using extensible paper bags ever since.

We have eliminated much of our breakage and our customers report they are much better satisfied with these bags. Our present Bemis extensible paper bag is superior to any others we have used to date.

Glades Chemical Company

W S Plumer

W. S. Plumer, President

Like these savings and benefits? Then call your Bemis Man right now.

WHERE FLEXIBLE PACKAGING IDEAS ARE BORN

Bemis

GENERAL OFFICES—
408 PINE STREET
ST. LOUIS 2

BEMIS

Herbicide Use Brings Suit

A lawsuit seeking $188,011.02 in damages has been filed in Superior Court, Tucson, Ariz., by A. S. & R. Farms, Inc., an Avra Valley cotton-growing corporation, which alleges that a weed-killer damaged the cotton plants instead of increasing productivity.

Named as defendants are E. I. du Pont de Nemours & Co., Inc., the White Chemical Co., and Earl T. Horton and his wife, Annie.

In July, 1957, the complaint alleges, Mr. Horton and the plaintiff corporation entered into an agreement under which Mr. Horton would treat some of the cotton fields with Karmex W. Instead of increasing the crop, the lawsuit claims, the treatment damaged the plants and retarded growth and production. Some 716 acres were treated.

Korea To Ban Imports

The Korean Vice Minister of Agriculture and Forestry, Jan Sup Kim, said last month that his government will ban or extremely restrict the import of ammonium sulfate fertilizer in the present fertilizer year, which began Aug. 1.

The step is designed to encourage the use of urea fertilizer, to be produced in Korea.

Acquire Illinois Firm

The Unexcelled Chemical Corp., New York, has acquired the Aylward Chemical Co., a midwestern producer of liquid fertilizers.

Aylward, which will be operated as the Aylco division of Unexcelled, operates four plants in Illinois. Unexcelled is a producer of metallurgical products, paints, varnishes, and insect repellants.

Withdraw Tolerance Request

The Food and Drug Administration of the Department of Health, Education, and Welfare has announced that Amchem Products Inc., Ambler, Pa., and the American Cyanamid Co., New York, have withdrawn their petition for the establishment of tolerances for residues of amitrol on apples, cranberries, and pears.

Grace General Manager

Dr. Robert Q. Parks (left) has been named general manager of the Grace Chemical Division, W. R. Grace & Co., Memphis, Tenn. Frank J. Ronan (right) will succeed Dr. Parks as general sales manager.

Dr. Parks joined Grace in 1953 as manager of agricultural services. He has been general sales manager since 1955. Mr. Ronan formerly was midwestern district sales manager for the division with offices in Chicago.

Kentucky Fertilizer Conference

The annual Kentucky Fertilizer Conference, held July 29 at the University of Kentucky, Lexington, featured a talk on pasture fertilization by E. C. Doll, a soils agronomist, who presented results obtained by research on the effects of proper fertilization on pasture yields and the effects of different fertilizer mixtures on grass-legume pastures.

Other speakers included Zenas Beers, midwest director of the National Plant Food Institute, who discussed the NPFI program for his area and its effect on agricultural production in Kentucky; and Warren Thompson, extension pasture specialist, who reviewed the various aspects of the extension pasture program for Kentucky.

P. E. Morrill Retires

P. E. Morrill, vice president of the Bemis Bro. Bag Co., St. Louis, has retired after 45 years of service with the company. He will continue as a director of the company.

Cyanamid Names McCormick

Frederick E. McCormick has been appointed manager of commercial development for the American Cyanamid Company's Agricultural Division.

Mr. McCormick has been with Cyanamid since 1957.

Special Projects Engineer

A. R. Hughes, formerly manager of the Philadelphia district office of Brooks Rotameter Co., has been named to the newly-created position of special projects engineer by the Fischer & Porter Co., Hatboro, Pa.

New Screwworms In Florida

Screwworms — target of a Federal-State eradication effort — were discovered infesting livestock, June 17, near Lake Placid in Highlands County, Florida. This was the first screwworm case reported in the southeastern U. S. eradication area since Feb. 19.

Sterile screwworm flies were released in greatly increased numbers in the area to prevent further infestations. The general release of sterile flies was begun in July 1958. The present eradication effort, which includes the release of 50 million sterile flies weekly, will continue until it has been determined that the screwworm has been eliminated from the southeast.

To Build In Greece

Italy's Ammonia Casale and Germany's Friedrich Uhde will build a nitrate fertilizer plant in Greece, at an estimated cost of $39 million. The plant will be built at Ptolemais, and will turn out 300,000 tons of fertilizer per year.

Start Phosphorus Production

The Central Farmers Fertilizer Co. has started production of elemental phosphorus at its Georgetown Canyon complex in southern Idaho. The firm's elemental plant is in operation on a 25,000 kilowatt energy basis and the firm started up the phosphoric acid and fertilizer units last month.

CFFC produces a very high analysis superphosphatic fertilizer. The material is not called treble superphosphate, as is customary in the trade, however. It is referred to as high analysis, 52% P_2O_5 fertilizer.

If your product needs a special type lining for its steel pail or drum, do as other manufacturers have done: COME TO VULCAN FIRST! There are many reasons why manufacturers of hard-to-hold products turn to Vulcan for a solution to their lining problems. These reasons concern Vulcan's years of experience and research in the development of linings for a wide variety of products including chemicals, foods, drugs, oils, insecticides, paints, and varnishes, etc.

Contact Vulcan NOW regarding your lining problems! Vulcan chemists either have the proper protective interior lining for your product, or if none is presently available, will do their utmost to develop a new one. Samples gladly supplied upon request. Call or write Vulcan today.

Write Dept. AIM-79

VULCAN

Over 43 years Container Experience

VULCAN

CONTAINERS INC.

Bellwood, Illinois (Chicago Suburb)
Phone Linden 4-5000 from
other Cities

From Chicago Phone:
MAnsfield 6-7660.

In Canada: Toronto 15, Ontario;
New Westminster, (Vancouver), B.C.

Representatives in all principal cities.
See "Pails" or "Drums"
in the Yellow Pages.

Stress Proper Placement

Proper placement of fertilizer is begining to rank with proper amounts in the minds of today's farmers, Werner L. Nelson, Midwest Director of the American Potash Institute, told a meeting of the American Society of Agricultural Engineers on the campus of Cornell University June 23.

Speaking on principles of fertilizer placement before a special program of the society's Joint Power and Machinery Division and the National Joint Committee on Fertilizer Application, Dr. Nelson reported that many agronomists believe improper placement has been limiting fertilizer use.

He listed two main objectives of safe, efficient fertilizer placement: (1) to avoid injury to seedlings, and (2) to provide efficient use of nutrients from start to maturity.

•

Guenther Named By Merck

William E. Guenther has been appointed assistant to the operations and training manager in agricultural sales at Merck & Co., Inc., Chemical Division, Rahway, N. J.

Mr. Guenther, who joined Merck in 1949, has served as a sales representative in Birmingham, Ala., since 1956.

•

USDA Foreign Research Aid

Under its foreign research program, the U. S. Department of Agriculture has made four grants for research abroad — two to institutions in Finland and two to institutions in Great Britain.

The program, less than a year old, is being paid for with foreign currencies accruing in various countries to the account of the U. S. from the sale of surplus agricultural commodities. The four grants amount to nearly $500,000.

•

Joins Evans Research

Dr. Jane Connor has been appointed to head the radioisotope laboratory of the Evans Research and Development Corp., New York. Dr. Connor had been with the National Standards Laboratory in Australia and, most recently, was a research chemist at Michigan State. She received a Ph.D. in soil chemistry at Rutgers University.

•

To Manage Korean Plant

John J. O'Leary, who has been associated with the synthetic ammonia industry for nearly 40 years, is shown with his wife prior to his departure recently for Korea. Mr. O'Leary is plant manager of Korea's new urea fertilizer facility at Chung-ju.

Employed by F. H. McGraw & Co., New York, builders of the recently completed plant, Mr. O'Leary formerly was with the Allied Chemical Corp. and the American Cyanamid Co. Most recently, he assisted Cyanamid of Canada, Ltd. on the operation of new ammonia and urea plants at Hamilton, Ont.

McGraw-Hydrocarbon will be in charge of operations and the training program at the Korean plant for a period of two and a half years. Under the program, Korean trainees gradually will replace American personnel.

•

Receives 4-H Citation

S. L. Nevins, vice president of the Olin Mathieson Chemical Corp.'s plant food division at Little Rock, Ark., last month received one of the highest 4-H awards given to adults for "outstanding contribution to 4-H Club work in America."

Mr. Nevins, who was one of four business men to receive the citation during the national 4-H conference in Washington, D. C., was largely responsible for Olin Mathieson's sponsorship of the national 4-H Alumni Recognition program.

•

Adding To Facilities

Construction has started on a major addition to entomological facilities at the University of California, Riverside. A three-story wing is being added to the present Entomology Building in the Citrus Experiment Station.

Cenco Acquires Soiltest

Cenco Instruments Corp., New York, last month acquired Soiltest, Inc., Chicago, for 18,000 shares of Cenco common stock and a cash payment, the amount of which was undisclosed.

Soiltest is one of the nation's largest designers and manufacturers of scientific instruments to test the condition and quality of soil, concrete, and asphalt.

•

Potato Wireworm Controlled

Control of the southern potato wireworm, a major insect pest in the early-season potato producing areas of the Southeast, has been achieved experimentally with several organic chemical insecticides, the U. S. Department of Agriculture reported last month.

Diazinon, ethylene dibromide, Parathion, Thimet, and two experimental materials — AC18, 133 and SD 4402 — gave 82 to 96 per cent reduction of the pests in field plot tests.

•

Southeastern Safety School

A southeastern regional school on accident prevention in fertilizer plants wil be held Aug. 27 and 28 at the Heart of Atlanta Motel, Atlanta, Ga. The meeting will cover basic material on supervisory training, fundamentals of accident prevention, safe handling of material, and housekeeping.

•

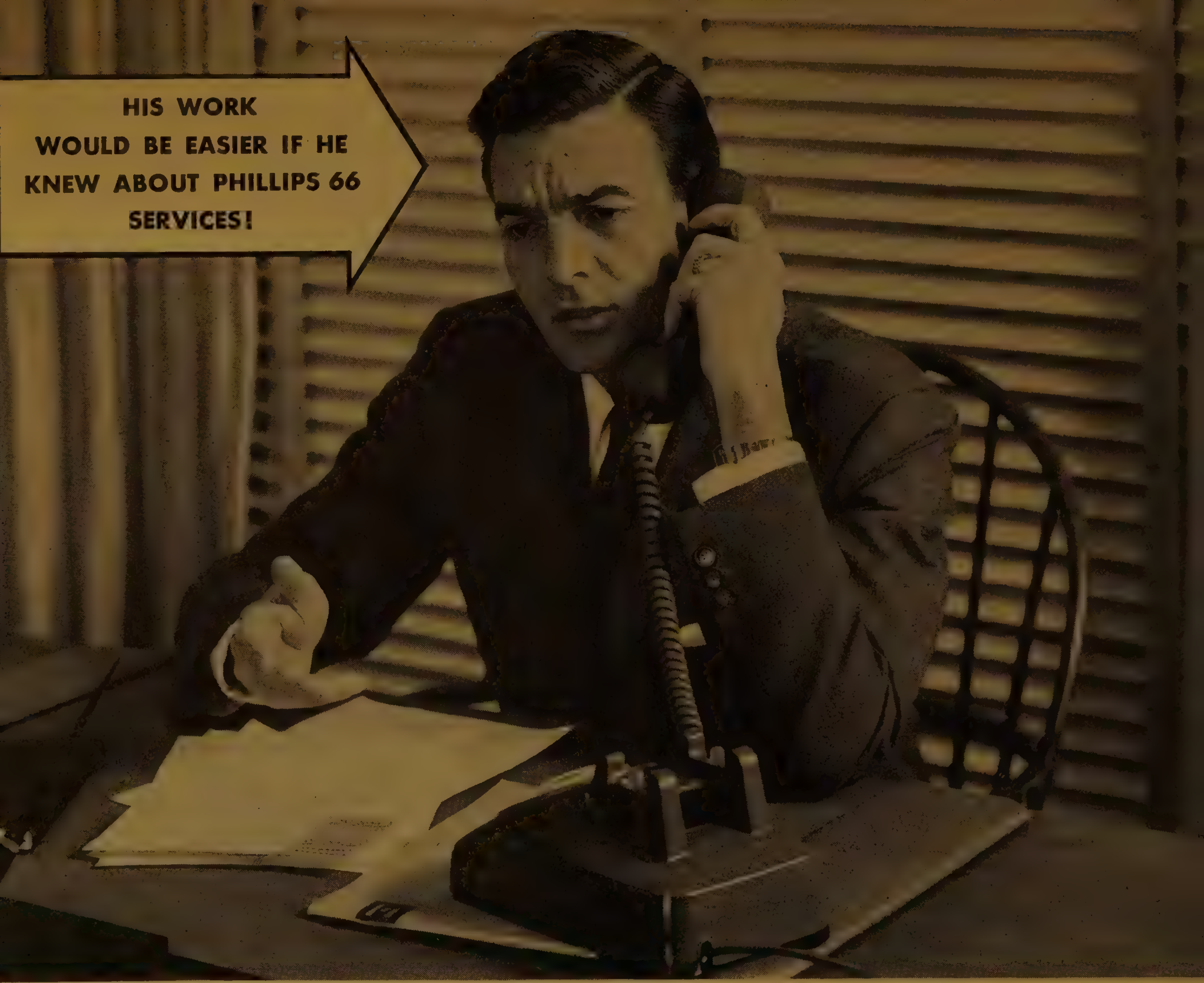
Particle Data Service

Interlab Inc., New York, has announced the introduction of a new particle data analysis service which will be operated from its New York offices in association with Particle Data Labs of Elmhurst, Ill.

•

New Leader Distributor

The Truck Equipment Co., Fort Smith, Ark., has been appointed as a distributor for the Highway Equipment Co., Cedar Rapids, Iowa. They will handle New Leader lime spreaders, combination lime and fertilizer spreaders, and other equipment in Ark.



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Equipment, Supplies, Bulletins

Multiwall Bag Feeder

The Bemis Bro. Bag Co., St. Louis, Mo., recently announced that it has developed an efficient and fully operational automatic open-mouth multiwall bag feeder. The feeder is said to operate at speeds of 16 bags per minute, and at even higher speeds with some free-flowing products with ample bin supply systems.

The Auto-Mac feeder handles a wide range of bag dimensions; 50 pounds and up. Engineering specifications and operational data are available from the company's Packaging Service Department at 305 — 27th Avenue, N.E., Minneapolis 18, Minn.

•

42" Diameter Micronizer

A 42 inch diameter Micronizer fluid energy mill, the largest ever manufactured, has been fabricated and shipped by the Sturtevant Mill Co., Dorchester, Mass.

The mill has a grinding capacity of 50 per cent more than the 36 inch units, formerly the largest unit produced. It has a maximum capacity of from 750 pounds to over three tons per hour, depending upon material and fineness desired.

•

1959 Pesticide Handbook

The 1959 edition of the Pesticide Handbook, published by College Science Publishers, State College, Pa., lists the names, active ingredients, and manufacturers of more than 7,000 insecticides, fungicides, herbicides, rodenticides, and other agricultural chemicals and equipment.

A complete revision of the 1958 edition, the handbook also contains valuable information on current legal tolerances for all pesticides, as well as a general discussion of the uses, compatibilities, and antidotes for all pesticides, both old and new.

•

Stepped-End Multiwall Bag

New stepped-end multiwall shipping bags, made especially for fertilizers, chemicals, insecticides, and building materials are being offered by the Ames Harris Neville Co., Berkeley, Calif.

•

Munson Data Sheet

A data sheet giving information and specifications on attrition mills is being offered by the Munson Mill Machinery Co., Utica, N.Y.

The two basic types of mills outlined on the data sheet are Double Disc and Single Disc mills. Complete specifications are offered as to construction and performance.

•

DirectoJet Spray Device

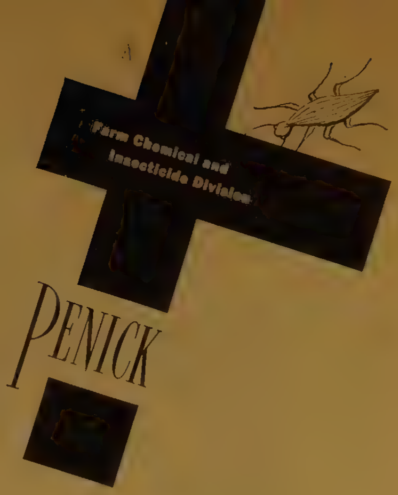
The Spraying Systems Co., Bellwood, Ill., has developed the "DirectoJet", a single assembly that combines spray nozzles and control valves for tractor-mounted broadcast spraying.

The device is designed with a control valve that provides spray to either the left or right side of the tractor, or to both sides at once, as well as on-and-off control, with the entire desired sequence of operations completely controllable by the operator from the tractor seat.

•

Chloro-IPC Publication

The Columbia Southern Chemical Corp., Pittsburgh, Pa., has prepared a 162-page handbook on Chloro-IPC and its use for weed and grass control. The publication covers the use of Chloro-IPC (isopropyl N (3-chlorophenyl) carbamate) on more than 100 crops.


Farm Chemical and Insecticide Division
PENICK

Penick Insecticide Booklet

S. B. Penick & Co., New York, has prepared an attractive, 40-page booklet that describes the operations and organization of its Farm Chemical and Insecticide Division.

Chemicals produced by the division are described in detail as are the company's various research and production facilities and control laboratories.

•

Diluent Compatibility List

The Specialties Department of the R. T. Vanderbilt Co., New York, is offering a bulletin on the compatibility of Vanderbilt diluents with agricultural toxicants. The bulletin is arranged so that the new and most commonly used toxicants are listed in a chart that can be posted on a bulletin board as a handy reference.

•

More Stretch Paper

The St. Regis Paper Co., New York, is expected to begin semi-commercial production of its stretchable paper, Duostress, this month at its Carthage, N. Y., plant.

Duostress is a paper with a creped and embossed surface; it is said to possess high, equal strength in the machine and cross-machine directions. In bags, Duostress stretches about seven per cent in the machine direction and five per cent in the cross-machine direction. Comparable figures for Clupak stretchable papers, manufactured by several bag makers under license from Clupak, Inc., are 10 per cent and four per cent. Under impact, extensible paper bags "give", thus preventing breakage. The paper is resistant to scuffing and slipping, can be coated with asphalt.

THE MAN WITH THE MULTIWALL PLAN

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PACKAGING SPECIALIST
GENE CARTLEDGE

helps Multiwall user reduce bag costs $4.05 per M

In Multiwall packaging, paradoxically, it's sometimes necessary to add in order to reduce. Take the case of one leading company whose bag designs recently were analyzed by Union Packaging Specialist Gene Cartledge.

The firm uses Sewn Open Mouth Multiwalls in part of its operation. Cartledge recommended adding Union's special SEW STRONG construction (reinforcing strips at top and bottom of bag). The stronger closure enabled the basis weight of each bag to be reduced by 10#. The new sewing method led to a reduction in bag length, an improved bag design—and $4.05 per M savings! Another recommendation: convert all the firm's present Sewn Valve Multiwalls to Sewn Open Mouth types. This complete changeover will further streamline bagging and, based on the company's annual requirements, result in thousands of dollars in additional savings.

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Cotton Pest Control Folder

Recommended procedures for the control of cotton pests are outlined in a leaflet published by the Stauffer Chemical Co., New York. The leaflet describes the available formulations of Trithion, dosage recommendations, and application methods for the control of two spotted mites, cinabar mites, tropical mites, cotton aphids, leafworms, and leaf perforators.

Disposable Paper Clothing

Disposables, Inc., New York has been formed to manufacture and sell disposable paper clothing. The product line includes shirts, pants, laboratory or shop coats, aprons, hats, over-shoes, and medical examination gowns.

Rename Bag Closure System

The Chase Bag Co., New York, has renamed its moisture-proof bag closure system. Now called "Chase-tite", the system is a method of closing both ends of multiwall bags with a seal that gives protection against moisture penetration. The bottom closure is made by Chase when the bag is manufactured.

Develop New Spray Oil

A lighter version of the original "superior" spray oil developed by entomologists at the Cornell Experiment Station in Geneva, N. Y., has been introduced for trial by fruit growers this season.

The chief advantage of the new product, designated as "70-second superior oil", is said to be its safety for use on fruit trees without loss of insecticidal efficiency.

Plant Diagnostic Kit

The Plant Science Products Co., Berkeley, Calif., has introduced a "Profit Plant" diagnostic kit that contains packets of 12 plant food elements, pictures of plants with the general symptoms of mineral deficiencies, and instructions for foliar feeding of plants.

After a deficiency is identified by the pictures and instructions, a corrective test application is made. One packet of the needed element mixed with water in a bottle supplied with the kit makes a proper concentration for foliar application. The treated plant then is watched for response. The purpose of the kit is to enable growers to identify deficiencies without chemical analysis.

Miller Redesigns Label

The Miller Chemical and Fertilizer Corp., Baltimore, Md., has re-designed its label for three home pest and weed control chemicals. The new labels, lithographed in four colors on "F" style cans (quarts and gallons), are expected to increase shelf appeal.

Bucket Elevator Chain

Beaumont Birch Co., Philadelphia, has prepared a drawing of its bucket elevator chain, showing builtup wearing tread. The chain with builtup area was developed in 1950 and improved in 1958. Hole spacing for attaching the buckets and the pitch is 6.05".

PVC Relief Valves

For corrosion-resistant applications not covered by other valves, the Milton Roy Co., Philadelphia, last month announced some newly-developed polyvinyl chloride relief and back pressure valves. The valves are designed to protect positive displacement pumps metering such process liquids as dilute sulfuric acid and hydrofluosilic acid.

EDITORIAL

(*From Page* 31)

growing over the past few seasons. It has hit a peak this year.

A number of producers who were slow in jumping on the band wagon are a little unhappy over missing their share of a growing business this season. And, if you are one of those who have been slow in investigating granulars, our suggestion is that you start working now toward formulations of this type for 1960.

WASHINGTON REPORT

(*From Page* 66)

fertilizer sales. Now increasing technology, better education of the farmer, new sales promotion programs, and the farmer's need to produce more efficiently have become large factors in farmers' decisions to buy or not to buy fertilizer.

With pesticides, insect, disease, weed and rodent infestations have loomed as larger factors impelling sales than farm income. The indications are that farmers' desire to produce more efficiently may cause slightly increased sales of fertilizers and pesticides if the drop in farm income is slight.

What concerns fertilizer and pesticides manufacturers, no less than politicians, is what might happen if farm income takes a real nose-dive. So far there are no indications here that the farm income drop will be that drastic.

* * * * *

Although many Pesticide Industry executives are not fully aware of it yet, organic gardeners have launched a campaign to encourage property owners to file legal damage claims against spray applicators and manufacturers. Organic gardeners make no bones about their main objectives. Harassing the Industry with a stream of adverse publicity, they say, in effect, is more important than the amount of money involved.

As every lawyer knows, each court case serves as a platform for repeating unfounded charges that pesticides are damaging plants, animals, fish, wildlife and endangering human health. Such adverse publicity is calculated to affect the Industry even when the court cases are lost as the "DDT Trial" in N. Y. was lost in 1958.

Behind this desire to undermine public confidence in pesticides, is the organic gardeners' desire to make more people aware of "nutritional problems" and in this way "put organics on the map throughout the nation." With this

The LINE RIDER really mows 'em down!

THE LINE RIDER AND HIS GANG of Diamond Chemical killers can rid your roads of troublesome weeds and bushes. They'll do it quickly and save you money like they did out Ohio way, where they saved $18.75 per mile!

Meet the gang:

FOR MIXED BRUSH—LINE RIDER LV-3D/3T, a 2-Ethyl Hexyl Ester formulation of 2,4-D and 2,4,5-T containing 3 pounds each of acid equivalent per gallon.

FOR MAPLES AND OAKS—LINE RIDER LV-6T, a 2-Ethyl Hexyl Ester formulation of 2,4,5-T containing 6 pounds of acid equivalent per gallon.

FOR AREAS ADJACENT TO SENSITIVE CROPS—LINE RIDER AMINE 22, an alkyl amine salt formulation of 2,4-D and 2,4,5-T with 2 pounds each acid equivalent per gallon. Applied as a water-borne spray.

FOR SPECIAL CONDITIONS—Available are other standard LINE RIDER formulations, including Butyl and Low Volatile Esters of 2,4-D and 2,4,5-T containing 4 pounds acid equivalent per gallon.

If you want deadly marksmanship, send for new brochure giving details. Write Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

kind of motivation to spur them on, organic gardeners can be expected to keep Industry lawyers and public relations men busy.

* * * * *

Aerial applicators are hoping for early action on a bill introduced by Rep. Joe M. Kilgore (D. Tex.) to rebate one cent a gallon of the gas tax on aviation fuel used in operations serving farmers. Mr. Kilgore's bill would amend the internal revenue code, and, in effect, give to aerial applicators benefits similar to those already applied to the use of gasoline in tractors and other farm implements.

The House Ways and Means Committee, which would hold hearings and pass on this bill, already has a heavy schedule of work for the remainder of this session. Chances are Mr. Kilgore's bill will be scheduled for action early in the next session of this Congress; that is to say, early in 1960.

* * * * *

As predicted earlier, the House gave its approval to H.R. 6436 which would include nematocides, plant regulators, defoliants and desiccants under the Federal Insecticide, Fungicide and Rodenticide Act. The bill would place these chemicals as well under the Miller Pesticide Residue Amendment to the Federal Food, Drug and Cosmetic Act.

The measure would become effective upon enactment in order to permit prompt registration of the chemical products affected by USDA and action by the Federal Food and Drug Administration in establishing tolerances for them on raw agricultural products. Certain provisions of the act could be postponed if either of the Government departments decide their immediate enforcement would work a hardship.

The measure had the support of USDA, the Association of American Pesticide Control Officials, the National Agricultural Chemicals Association, and a number of other agricultural organizations. Enactment of the bill into law is expected without undue delay.★★

TVA DEMONSTRATION

(From Page 34)

tion which warrant further investigation were suggested,—these include: (1) separation of the two distributors, thereby eliminating, perhaps, a zone of high temperature; (2) keeping a low bed depth in the ammoniator (3) keeping the bed from becoming too wet; (4) possibility of preneutralizing acid and solutions — very little work done along this line, but further investigation is considered worthwhile.

Production of High Nitrogen

R. D. YOUNG described to attending fertilizer technologists a series of tests on the different formulations for 20-10-10 and 16-8-8 grades, using various materials to supply the major portion of the nitrogen content. Among the materials were ammonium sulfate, solid ammonium nitrate, 83 per cent ammonium nitrate solution, and TVA produced 30-10-0.

The 30-10-0 ammonium phosphate nitrate has been produced in demonstration scale equipment by TVA during the past year for use in educational programs. It is made by granulating wet ammonium nitrate crystals with phosphoric acid and anhydrous ammonia in a rotary drum. The product is dried to about .3 per cent moisture, screened at minus 6 plus 16 mesh, and coated with a conditioning agent. It is shipped either in bags or in bulk, and is available in limited tonnages to fertilizer manufacturers for trial use in mixtures at $58 per ton, bulk, fob, Sheffield, Ala.

While 30-10-0 is produced primarily for bulk blending, and direct application, reported Mr. Phillips, it is well suited as a raw material for the production of inverse ratio grades (that is high nitrogen grades). Formulation of the high nitrogen grades with ammonium nitrate solution does not appear to be attractive, because the large amount of liquid phase in the formulation makes it necessary to use a high rate of recycle (4320 lb./ton of product) to obtain satisfactory granulation. Furthermore, use of the ammonium nitrate solution requires special facilities that are not available in most plants, since it must be kept hot to avoid crystallization.

Use of ammonium sulfate and ammoniating solutions as the source of nitrogen produced a satisfactory 16-8-8. A minimum of 8.5 units of ammonium sulfate was required for operation to avoid excessive agglomeration.

Storage tests of the 16-8-8 and 20-10-10 grades produced in the pilot plant showed that unconditioned 20-10-10 had only a light bag set after one month of storage. When conditioned with 2.5% kaolin or Celite, little or no bag set occurred during 1 to 3 months of storage. When the 16-8-8 product had been cured one week and conditioned, a medium bag set occurred during one month of storage, but there were no lumps after the drop test.

Several of the 20-10-10 products with and without the addition of a coating agent were stored in open piles for 1 to 4 weeks. During humid periods a moist layer ½ to 1-inch thick formed on the surface of the pile. During less humid periods, this layer would become dry and would cake lightly. The material beneath this layer was in good condition.

Granular No-Nitrogen Grades

"In granulation of fertilizer grades that contain nitrogen, the reaction of ammonia with superphosphates or acid plays an important part in providing conditions that are favorable to granulation", continued Mr. Young. This reaction is not available as an aid to granulation of no-nitrogen grades. These grades usually are made by granulating super-

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A *Powered Flow-Divider* assures even distribution of materials to both spinners, regardless of the position of the L-42S on hillsides or level ground. Customers appreciate this feature as it results in an even crop growth throughout the field.

Protect your investment . . . insist on GENUINE New Leader replacement parts.

NEW LEADER Model L-14S LIME SPREADER

is a high quality rig with a low price tag!

Cut your in-the-field costs with this simple to operate, easy to maintain spreader. Merely set the feedgate opening, start the truck, engage the PTO and start spreading! Material is delivered to the twin spinners over a wide 24″ conveyor. Also available with a center dump for stock piling and windrowing.

NEW LEADER *Engine-driven* Spreaders: Model L-52S with 24″ conveyor is built for widespread use. Model L-62S with a 30″ conveyor is for extra heavy, widespread lime applications. Both spreaders can also be used for fertilizer.

Model L-19S Combination Spreader With PTO Drive, 24″ Conveyor and Twin Spinners Delivers Fast, Uniform Spreads!

Simple operation saves time and upkeep. Just set the feedgate opening . . . start the truck engine . . . engage the PTO . . . start spreading! The body has 45° angle sides to prevent bridging—heavily reinforced to stop warp and twist—extended 6″ higher to hold bigger payloads with less blowing.

NEW LEADER *Engine-driven* Combination Spreaders are also available: Model L-22S with a 7.0 h.p. engine and Model L-32S with a 12.5 h.p. engine to deliver plenty of power for heavy applications of lime or fertilizer.

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phosphates or mixtures of superphosphates with potash salts. No-nitrogen grades 0-14-14, 0-20-20, and 0-25-25, have been produced by TVA researchers by addition of phosphate rock and sulfuric acid in the formulations.

The phosphate rock, potash, ordinary and/or triple superphosphate, and recycled fines were fed in the usual way from belt feeders to a collecting belt, which discharged into the continuous ammoniator drum. The acid was fed beneath the bed through a drilled pipe distributor containing twenty holes 3/32 inch in diameter; distribution was over about the first half of the length of the drum. When sulfuric acid was used, enough water to dilute it to about 70 per cent H_2SO_4 was fed into a mixing wye on the distributor. Steam, when used, was fed through a slotted distributor of the type commonly used for nitrogen solutions. The proportion of the P_2O_5 supplied by the rock and acid varied from one-third to all of the phosphate in the formulation.

(Editor's Note: A more complete discussion on granulation of "no-nitrogen" grades of fertilizer will appear in a later issue of *Agricultural Chemicals*.

The discussions at the TVA meeting were followed by pilot plant demonstrations of related production operations. In the demonstration of no-nitrogen granulation, production of 0-25-25 was the grade fertilizer produced, using phosphate rock-phosphoric acid to promote granulation. In the high nitrogen fertilizer demonstration, 30-10-0 ammonium phosphate nitrate was used in production of 20-10-10 granular fertilizer. Industry representatives were invited to ask questions concerning any phase of the discussion and demonstration.★★

PEST ROUNDUP

(*From Page* 65)

Hatch in the Mississippi Delta was expected to be light and square infestation was only 2.6 per cent. Only a few farmers in the Tallulah, La., area were treating for weevils by the latter part of June, and the Arkansas situation was described as looking good, with the number of weevils being low. Infestation counts in the Waco, Tex., area averaged 37 per cent in untreated fields, and 8.5 per cent in treated fields. The first evidence of boll weevils in Missouri was from Dunklin county, in late June, where 1.5 per cent punctured squares were reported from 6 fields checked.

Cotton bollworms were causing little damage in South Carolina by late June, and moth catches were lighter than in 1958. Bollworm eggs were increasing in Tennessee. Some damage was reported from the western area, but predators were numerous. Moth catches were low in the Mississippi Delta and egg deposition light, as was the case in the Waco, Tex., area. Egg numbers were light in Arkansas and Missouri. Some bollworm damage was reported from Chaves and Eddy counties, N.M. The Winterhaven area of Imperial county, Calif., reported medium infestations of the worm.

During the middle of June thrips were causing concern in several states. Severe injury from the insect was reported from southeastern Missouri, western Tennessee, delta counties of Mississippi, sections of Oklahoma, Texas and Arizona. Spider mites were becoming serious in many San Joaquin Valley, Calif., fields. Severe spotted infestations were also reported from Arizona and North Carolina. Lygus bugs were becoming a problem on cotton in Eddy and Chaves counties, New Mexico, and the tarnished plant bug was the number one problem in the Mississippi Delta.

Other Insect Activity

SCREW-WORMS were found infesting livestock, June 17, near Lake Placid, Highlands county, Fla. This is the first case reported in the southeastern eradication area since February 19, 1939.

Vegetable insects have been relatively light this spring. The Colorado potato beetle has been reported as causing some damage in Washington, North Dakota, Delaware and Maryland. Adult populations of the beetle were several times greater in the Moscow, Idaho, area than at any time during the past five years. Populations were higher in upper Snake River Valley fields than during the past two seasons.

Mites were perhaps the most noticeable fruit pests during late June. In Illinois, populations ranged from zero to destructive. Some browning of leaves was reported from Pennsylvania. Heavy populations were reported from localized areas in Virginia, South Carolina and New Mexico. Heavy infestations of the Douglas-fir tussock moth were damaging on 18,000 acres of white fir in Sandia Mountains, Cibola National Forest, and 1,500 acres in Lincoln National Forest, New Mexico. Controls were being applied.★★

AERIAL SHOW

(*From Page* 62)

son, director of the Mississippi Aeronautics Commission; and Fred Weick, director of Research for the Piper Aircraft Corporation.

After the activities at the airport, the group were guests of Dr. Raspet for lunch at the University. Dr. Raspet reported on the flight tests and Fred Weick gave a talk about his new Piper airplane and other related data. Ed. Collard gave a rundown on the Call-Air.

A Research Committee was named by President Cy Emery of the Mississippi Aerial Applicators Association. Ben White will serve as chairman. Working with him will be Ed Collard, Dominic Correro and L. T. Wade Jr. This will be a coordinating and planning committee working on promoting research for the benefit of the aerial applicator in Mississippi.★★

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The Soil Conservation Society of America will hold its 14th annual convention in Rapid City, South Dakota, August 26, 27, and 28.

LISTENING POST

(From Page 63)

sprayer was used to apply the chemicals. It took about 1.5 gallons of spray to cover each 25-plant row to the point of run-off. The first application of Dithane Z-78 (65% zineb; Rohm and Haas Company), 2 pounds to 100 gallons, was made on July 25, the last on September 4. D-113, 1250 ppm, was applied on July 25 and August 13. Of the two sprays of Acti-dione-S the first, at 100 ppm, caused moderate injury, and the second, at 10 ppm, was therefore postponed until August 25. Results were evaluated on September 29. On the variety Viking, mean infection indexes were: for Acti-dione-S 1.68; for Dithane Z-78 1.93; for D-113 2.91; for the control 4.88. On the Mary Washington variety, the infection index was 2.35 for Acti-dione-S compared with 5.84 for the control plants; only Acti-dione-S was tested on this variety.

Dr. Murakishi concluded that the results of these trials showed both Acti-dione-S and D-113 to possess rust-controlling properties. He considered that the injury from the first spray of Acti-dione-S 100 ppm at East Lansing was probably due to the greater volume per plant applied by the power sprayer as compared with the hand sprayer (¼ quart as compared with 1/10 quart per plant).★★

PESTICIDE LAWS

(From Page 48)

in or on raw agricultural commodities may be involved, because of the interrelationship of the two Acts.

The amendment proposed by H.R. 6436 would become effective upon enactment and thus permit the Department of Agriculture to begin the registration of the newly regulated products, as required by the Federal Insecticide, Fungicide, and Rodenticide Act, and also permit the Department of Health, Education, and Welfare to establish tolerances for them on raw agricultural commodities under the Miller Amendment. However, in order to permit an orderly transition period for both the Government and the Industry, and to allow Industry an opportunity to collect any additional data or make any labeling changes required by the legislation, provision is made to defer the applicability of certain sections of the Insecticide Act and the Food and Drug Act to some of these product until March 5, 1960 or such later date or dates, not beyond March 5, 1961, as the Secretary of Agriculture and the Secretary of Health, Education, and Welfare may prescribe on the basis

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of a determination that such postponement is necessary to avoid hardships and will not be unduly detrimental to the public interest. These dates have been specified so as to have the fully effective dates under this bill coincide with those under the Food Additives Amendment to the Federal Food, Drug, and Cosmetic Act (P.L. 85-929). Since some products which would be affected by this bill are presently subject to the Food Additives Amendment, It has appeared desirable that the two become fully effective at the same time.

By placing nematocides, plant regulators, defoliants and desiccants under the Federal Insecticide Act and the Miller Amendment to the Federal Food, Drug, and Cosmetic Act, the bill would provide for expert judgment by the Department of Agriculture on the agricultural considerations involved in the sale and use of these products and by the Food and Drug Administartion on the determination of tolerances, if any are necessary for the protection of the public health. It would provide a uniform system of control for agricultural chemi,cals, both for the growers and others who use them and for the Industry.

It is our belief that this legislation will be of benefit to the growers by assuring careful review of labeling claims and directions for use by the U. S. Department of Agriculture before the products are offered for sale in interstate commerce and will also assist the farmer by assuring him that if he follows the label directions on these agricultural chemicals his produce will be safe and within the tolerances established by the Food and Drug Administration.

The proposed legislation will also set a pattern which would enable the states to adopt similar amendments to their state pesticide laws. We know that many states are awaiting passage of this legislation so that it can be adopted as part of a uniform state legislative program. We sincerely hope that, if and when a state decides that these products should be regulated, it will follow the pattern of this legislation rather than some other kind of legislation regulation. We would like to solicit your support of the two bills and your help in securing enactment of the legislation during the current session of the Congress.

Fertilizer-Pesticide Combinations

I previously quoted from the resolution adopted by both the pesticide and fertilizer control officials' associations. There is another part to the resolution which states that:

> "(2) In the case of a product which consists of a combination of both plant foods and pesticides or other regulated chemicals or a product claiming both plant food and other regulated chemical value, it should be subjected to control under both the applicable aforementioned laws."

Our Association supports that principle. We have no objection to such products being registered under both the fertilizer and the pesticide laws. However, after this reguirement has been met, the products should be eligible for sale. We take strong exception to the refusal of some states to accept for registration combination fertilizer-pesticide products. This action is usually taken under the authority of the fertilizer law rather than under the pesticide law. We believe that the refusal to register such products is unjustifiable. As long as a product is effective, properly labeled, and in compliance with the requirements of both the fertilizer and pesticide laws, it should be registered and permitted to be sold and used in the state. We believe that farmers and growers should not be deprived of the benefits of such products if they wish to use them because of arbitrary regulations or rulings.

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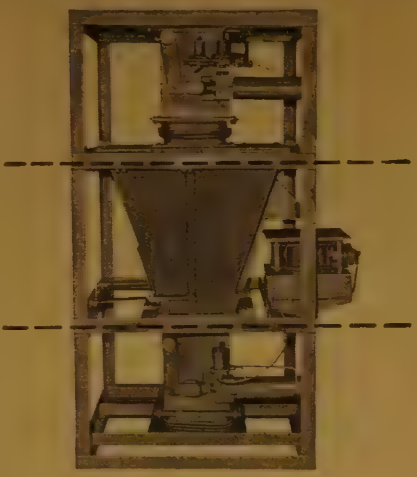

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in that of adverse publicity. Much of this material is distributed by small but well-organized groups who seek to persuade the public that pesticides are harmful and that their use should be severely restricted, or even banned, by legislation.

It has long been acknowledged that much of this type of publicity is based on fear which, in turn, is fostered by unfamiliarity with the subject. NAC firmly believes that knowledge of the facts can and will adequately defend the Industry's position in any case involving the proper and recommended use of pesticides. To this end, NAC sincerely requests regulatory officials, agricultural leaders, scientists, extension service personnel and all others who are in frequent contact with the public, to share in the responsibility of disseminating correct and factual information on pesticides and other use. Through these means opposition to these products will be replaced with approval.

Along these lines, we believe that pesticide control officials should be more aggressive in defending their laws and the protection which they afford the public. Unless this is done, we believe that it will not be too long before pesticides will be banned for many purposes or unduly restricted for others. Likewise, we may find that the control of pesticides has been removed from the Department of Agriculture and the land-grand colleges and turned over to other agencies which are not familiar with the products, their usage, and benefits. This will result in undue restrictions on pesticides and adversely affect the agricultural interest of our Country.

In conclusion, we would like to solicit an expansion in the cooperation of regulatory officials which we have so greatly enjoyed in the past. As many of you know, NAC takes an active part in state legislation affecting pesticides and other agricultural chemicals. If any piece of legislation adversely affects those products, we will be involved in it sooner or later. We believe that it would be mutually advantageous for the regulatory official and NAC to establish contact as early as possible on any legislation pertaining to pesticides and related agricultural chemicals. Whether the proposed legislation is a bill which the regulatory official is proposing, opposing, or taking no action on, he and NAC have a common interest in it. By getting together on the proposal, we can resolve any differences or misunderstandings about it, if there are any, or we can combine our efforts to support or oppose the proposal if it is one on which we have a common viewpoint. It is always much easier to correct a bill before it is introduced in a legislature or to amend it properly while it is still in committee than it is later on after it has received floor action. Hence, we would like to request that each pesticide control official contact us promptly whenever pesticide legislation has been introduced or is even being discussed in his state. We, in turn, will advise the regulatory official, as we have tried to do in the past, of any proposed or pending legislation which we believe warrants his attention. By this cooperative action, we can both better serve the interests of agriculture and the public generally.★★

FUMIGANT APPLICATOR

(From Page 57)

using the parts mentioned in the accompanying list.

PARTS LIST

Quantity	Item	Description
1	1	Notched plow coulter
2	1	Chisel assembly
3	1	Pressure gauge (not over 50 lbs.)
4	1	Shut-off valve
5	1	Marine gear pump
6	1	Line screen, brass
7	1	Pressure regulator, brass, ½ in.
8	1	Flow-regulator assembly
9	3	Fittings, Imperial, ⅜" x ¼"
10	3	Fittings, Imperial, ¼" x ¼"
11	10 ft.	Tubing, polyethylene "Poly Flo", ⅜ in.
12	15 ft.	Tubing, "Poly Flo", ¼ in.
13	1	Tee, brass, ½ in.
14	1	Tee, brass, ¼ in.
15	1	Ell, brass, ¼ in.
16	3	Pipe couplings, ¼ in.

Items 1 through 4 can be purchased from any farm implement dealer.

Item 5 can be purchased from any marine supply store.

Items 6 through 8 can be purchased from spray supply stores.

Items 9 through 16 can be purchased from any metals or tube company.

GREAT BRITAIN

(From Page 59)

is mainly confined to crop spraying, but in time will undoubtedly include more and more fertilizer application, slug baiting, seed sowing, and possibly even straight haulage jobs in inaccessible places, such as dropping fencing materials on mountain pastures.

The economics of agricultural spraying from the ground or by air are very difficult to assess. The cost of chemicals used by both methods is, of course, the same per acre. The aerial contractor, however, uses about ten times as much chemical per hour as would a ground applicator, so he may be able to purchase his chemical at an advantageous price. It is sufficient to say here, that contract prices for aerial spraying usually are about 50 per cent higher than for ground spraying.

For the farmer to pay this extra price willingly, the aircraft spraying has to have a number of advantages over ground spraying. The enormous increase in aerial spraying in the last few years is some indication that the technique has real advantages to the farmer. In fact, the advantages are numerous and have been described frequently elsewhere. The last two seasons in England, for instance, were very unfavorable for the use

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of heavy tractor-drawn sprayers because of wet ground.

To return to the more human aspects of the technique, however, the farmer usually is intrigued by the use of aircraft on his farm, but if he examines his crop and is unable to see the actual spray deposit he is liable to be bitterly disappointed. He immediately takes it for granted that the wind has blown all the spray on to his neighbor's farm and that he is paying good money for nothing. A number of firms, recently, have been developing oil sprays, which have several advantages over waterborne sprays. However, on the crop foliage these do not show up well and the customer tends to dislike them from the outset. He also jumps to the conclusion that spraying must be carried out under conditions of absolute calm and usually demands that only very small droplets be used.

In actual practice, it frequently is advantageous to use a reasonably coarse spray and to spray preferably while there is at least a five miles per hour cross wind. I have even seen cases where very good results have been obtained in winds as high as 20 miles per hour. For practical reasons, however, the average pilot does not like to spray in wind speeds much in excess of 12 to 15 miles per hour.

With the very rapid increase in aerial spraying activity, a number of new firms have come into being that have little or no technical background and that rely mainly on the experience of the pilots they have brought in. Now, continual research is going on into new techniques of aerial spraying, as well as into improved agricultural spray chemicals specially formulated for aerial application. While many of these smaller operators are able to carry out spraying on a routine basis, they inevitably acquire a number of prejudices and find it very difficult to adjust themselves to new techniques. The result is that a lot of spraying is being carried out today without the assistance of the most recent "know-how" and the results, naturally, are not as good as they might be.

Without extensive field trials to find out where the spray actually is going, it is difficult for the operator to obtain a true picture of the efficiency of his technique. It is only after many years of field experience, on a very wide range of crops under varying climatic conditions, that an operator can build up the pros and cons of every available technique. He cannot do this and fly the aircraft himself. Therefore, he has to rely on a technical staff in the field to tell him what sort of job he is doing and to advise him on improvements. The aircraft spray operator, today, is becoming more and more dependent on the "backroom" boys keeping him up to date with the new techniques and new materials.

In conclusion; aircraft have undoubtedly proved themselves capable of carrying out agricultural spraying in competition with tractors. Farmers, naturally and rightly, are skeptical of new techniques and they can see that there is room for improvement. Those who are in the lead of this new industry are developing improved techniques and new uses for aircraft with astonishing frequency. The British aircraft industry now leads the world in the development of economical light-weight power. This is a fact of the utmost importance and interest for the farmer, and I forsee a much closer co-operation between our agricultural industry and our brilliant aeronautical engineers. This co-operation however, will have to be centered around the many human aspects of the use of machines.★★

N SOLUTIONS

(*From Page* 40)

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The broad field of concentrated spray application has grown rapidly over the past few years so that today several times as many acres now are treated with concentrated spray as with conventional spraying and dusting. As a result many types of hand, ground, and aerial equipment have been developed for the application of myriad spray formulations and combinations. This book brings together and clarifies the fundamentals and potentialities of this whole subject.

Samuel Frederick Potts, author of this new book, has been in the agricultural chemicals industry for more than 30 years. He has published more than 70 articles, booklets, etc., on various phases of the industry. He has also been instrumental in designing new equipment and improvements in equipment for the application of agricultural chemicals.

some of them do not fill a real need. Notice the small deviations between some of the solutions. A specific example can be seen in 440 (24-70-0), 410 (22-65-0) and 448 (25-69-0); and another in 370 (17-67-0), 414 (19-74-0) and 414 (19-66-6). These minute differences are not detectable in plant operation. In other words, some of them could be dropped, which would further simplify the purchasing agent's problems.

Summary

(1) The basic principles of choosing nitrogen solutions: A well prepared table contains all the information that is needed to select the proper solution. In studying this table, the items to observe are:
  (1) Free to total nitrogen ratio
  (2) Salting out temperature
  (3) Vapor pressure
  (4) Water content
  In addition, some calculations plus a knowledge of the plant's equipment and operating conditions will resolve the hygroscopic salt content consideration.

(2) The economics in choosing nitrogen solutions is a matter of calculation using these basic principles. The magnitude of savings that are possible should not be overlooked.★★

PEST CONTROL

(From Page 42)

cides may be due to misuse and cleaning of spray equipment in ponds and streams. Most of the large-scale operations are under the supervision of competent Federal and State authorities, who have weighed carefully the economic benefits of controlling or eradicating serious pests against other values, including those associated with water resources.

There is real need to advise the public on large control programs well in advance so that they will be properly informed as to aims, nature of operations, benefits, and hazards. Close cooperation and trust between officials of different agencies is required to insure that all interests are protected adequately. A fish kill, whether small or inconsequential in terms of the total population in a lake or stream, will make the headlines. If there is no readily explained cause, it is often blamed on the use of insecticides. Even some representatives of wildlife organizations appear to be ill informed on objectives and merits of current insect-control programs, and also on research findings made several years ago from toxicological studies of DDT in relation to human health and also to fish and wildlife.

The Entomology Research Division recognizes the benefits and limitations of different control methods and is striving to meet the most urgent problems with available resources. Research is being undertaken on biological control, the development of additional crop varieties resistant to insect attack, possible use of hormones and growth-inhibiting substances as control agents, new ways to use insecticides such as baits with attractants, systemic insecticides that are specific against certain insects, and the continued release of males sterilized by gamma rays from a cobalt-60 source to destroy the reproductive potential of natural populations of insects.

With the expanding use of insecticides, there is a marked need for broad and detailed cooperative studies between entomologists, fishery biologists, and chemists to determine the direct and long-term effects on aquatic life of insecticides in current use and those expected to be used in future control programs. Of significance are preliminary laboratory experiments indicating that a number of the organic phosphorus and carbamate insecticides are less toxic to fish than some of the chlorinated hydrocarbons. Studies thus far on the effects of insecticides on fish-food organisms are limited almost to DDT. There is a dearth of information from field studies, which

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are essential for the practical evaluation of each insecticide and its effects on aquatic life.★★

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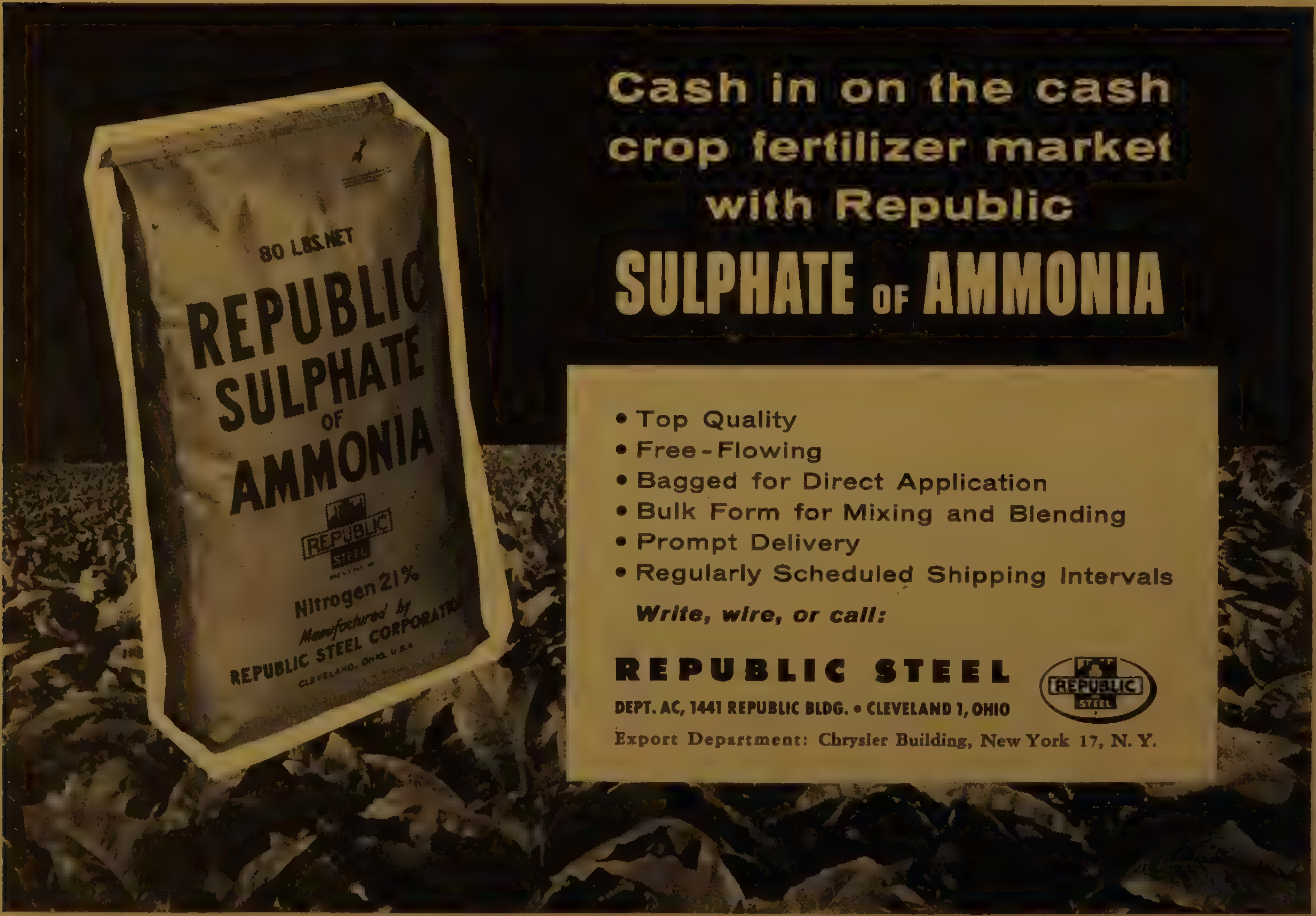

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LIQUID FERTILIZERS

(*From Page* 44)

initial finely divided form. Methods to avoid the difficulty with struvite are being studied currently.

Typical properties of the suspensions produced are shown in the table on page 44. Specific gravities and apparent viscosities were only slightly higher, for similar grades, than for liquid fertilizers made from furnace acid. The pH was also about the same. Some settling occurred on standing, giving an opaque suspension with an overlying clear liquid. The settled suspension was somewhat thicker near the bottom but it flowed freely and, as noted above, could be pumped without difficulty. The P_2O_5 content of the suspension layer was a litle higher than that of the upper layer. The lower P_2O_5 content of the clear layer may cause difficulty with official regulations on analytical tolerance if the product is sampled near the top of the tank without first being stirred. Adequate data on this point have not been obtained.

Variations in the neutralization procedure described above have shown some promise of improving the suspensions. The degree of settling was decreased for some grades by use of a small amount of clay or by keeping the pH high (about 8.0) during the neutralization and then adjusting to the usual level (6.5 to 6.7). While these variations decreased, stabilizing in several instances, the suspensions pumped equally well by any of the procedures used.

Most of the work described was carried out with acid from only one source. Tests are planned with other acids. Further work will also be done on the effect of operating variables.

Wet-process acid is being used for liquid fertilizer production in several plants in different sections of the country. The practice is relatively new and, as noted above, it appears that most producers apply the suspension immediately after preparation. As the practice grows, it is likely that problems encountered in storage will receive more attention.★★

The U. S. Steel Corp. has opened a resident sales office in Spokane, Wash., to market coal chemical products in Washington, Oregon, and northern Idaho.

The American Agricultural Chemical Co., New York, has announced plans to start construction this month on a contact acid plant at Cairo, Ohio.

AC

Larry Van Gordon has been named district manager at Palo Alto, Calif., by the Chipman Chemical Co., Bound Brook, N. J. He succeeds D. A. Zanette.

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ILLINOIS MEETING

(From Page 36)

nearly 10 per cent of the harvested cropland in Illinois.

Mr. Aldrich reported that the soil testing program is under continuous review and several improvements are contemplated. These include a new test for lime requirement, a study of field sampling, the addition of Dr. R. H. Bray's P_1 test for readily available phosphorus, and perhaps better moisture control in the samples for the potassium test. The P_2 test now used in county laboratories measures the phosphorous in rock phosphate and less available forms. Additional research is in progress to refine the calibration of the soil test for crop responses when fertilizer is applied.

Russell T. Odell, professor of soil physics reported that two years ago Illinois pioneered in developing "Production Potentials" for the major Illinois field crops on many of the important soils. Through the cooperation of the midwest office of the National Plant Food Institute, wall charts and check lists were widely distributed to fertilizer dealers, rural bankers, farm advisers, and vocational agriculture teachers.

Mr. Odell explained that the "Production Potentials" are not the highest yields that can be grown on a particular soil. But rather they are the long term average that can be expected with good management. Farmers should expect top yields at least 20 per cent higher in the best years, he concluded.

At a concluding session, the group discussed fertilizer recommendations for Illinois. Eight smaller groups were given the opportunity to comment on such phases of the program as sources of data for recommendations, bulk application, role of the county farm adviser, build-up vs. liberal crop fertilization, and a fertilizer program for wheat. The comments received by the Illinois agronomists are being summarized and will be sent to all participants.

During an informal session at the conference, The Illinois Fertilizer Association was formed. Robert Weis, Virginia-Carolina Chemical Co., E. St. Louis, was elected president.★★

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PACIFIC ESA

(From Page 36)

absorption of delnav into the leaf and killed mites feeding on the untreated surfaces.

The 1960 meetings of the Pacific Branch will be held in Spokane, Washington, in late June. Chairman for this meeting will be Dr. Hugh C. Manis, Department of Entomology, University of Idaho, Moscow. Convention headquarters will be at the Davenport Hotel, Spokane.★★

READERS DIGEST

(From Page 45)

truth—Mr. Strother in his article was writing with obvious bias. As long as he chose to discuss the gypsy moth spray controversy, he should have made it perfectly clear that after all the claims by critics of the program had been made before appropriate judicial authority, the case was essentially thrown out of court—He also overlooked the fact that down in the area where fire ant is being controlled, 97 per cent of those queried in the treated areas indicated that they were in favor of the control program—a vote of confidence of gigantic proportions."

In connection with the charges that insecticide use has an adverse effect on bird populations, Dr. Townsend comments concerning the fire ant spray program in Florida that "The local situation appears to contradict all claims of injury to wildlife. This area was originally a sawgrass swamp devoid of trees except for a marginal area around the lake. The only birds to begin with were waterfowl and buzzards. I have been here nearly 30 years and as homes have been built and trees planted we have had an increase in bird population and the introduction of new species. We now have mocking birds, cardinals, jays, sparrows, orioles, grackles, warblers and others that were not native here. This has occurred in an area where the agricultural use of the new insecticides is extremely heavy, and where the townsite has been under insecticide control for at least ten years. I have no figures on the bird population, but I know what I have seen."

We would recommend to the *Reader's Digest* that logical subjects for future articles might well be the important role of insecticides in protecting the Florida citrus industry against the Mediterranean fruit fly and the role of fumigants in the successful USDA program which has just finally resulted in eradication from the United States of the hall scale—highly destructive pest of stone fruits and nuts (see September issue for full details.)★★

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Address all classified replies to Box Number, c/o Agricultural Chemicals, P. O. Box 31, Caldwell, N. J.

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PESTICIDE EXPORTS

(From Page 49)

to 6,332 tons from 1,647 tons in January, 1958.

A detailed breakdown of pesticide export data is contained in the accompanying tables that were prepared by Harold H. Shepard of the USDA's Commodity Stabilization Service. The total value of export shipments in each commodity class is listed in Table 2 by order of importance. Earlier statistics on pesticide exports, prepared by the Bureau of the Census, listed shipments valued at $500 and over separately from shipments valued at $100 to $499. Table 2 is in terms of total shipments, but also lists the total values of shipments $500 and over and $100 to $499. It is notable that few shipments of polychlors are under $500 in value, while many more of the lower value shipments occur in the case of household pesticides, for instance.

In Table 1, commodities totalling over $1 million exported to any one country are arranged in order. The major effort of the program to eradicate malaria in India with DDT is reflected in Table II.

Table III

	Million
Mexico	$10.7
Canada	8.8
India	7.2
Egypt	5.7
Brazil	5.1
Colombia	2.8
Nicaragua	2.8
Venezuela	2.7
Cuba	2.2
Indonesia	1.8
Philippines	1.3
Guatemala	1.3
France	1.3
Japan	1.3
United Kingdom	1.3
Netherlands	1.2
Peru	1.2
Argentina	1.1
Union of So. Africa	1.1
El Salvador	1.1
Costa Rica	1.0

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INDEX to ADVERTISERS

Allied Chemical Corporation—
  Nitrogen Division ..... 67 to 70
American Agricultural Chemical Co. 20
American Cyanamid Co. 22
American Potash & Chemical Corp. 72
Amoco Chemicals Corp. 27
Ashcraft-Wilkinson Co. 11

Bagpak Div., International Paper Co. ..... July
Baughman Manufacturing Company 92
Bemis Bro. Bag Co. 78
Bradley Pulverizer Co. 15

Call Air 64
Chase Bag Co. 4
Chemagro Corp. ..... 2nd Cover
Chemical Construction Corp. ..... June
Clark Equipment Co. ..... July
R. D. Cole Mfg. Co. ..... June
Combustion Engineering, Inc.,
  Raymond Division ..... July
Cox, Dr. Alvin 101

Diamond Alkali Co. 61, 86
Dorr-Oliver Co. 77
Duval Sulphur & Potash Co. 11

Eastern States Petroleum &
  Chemical Corp. ..... May
Eastman Chemical Products, Inc. ..... June
Escambia Chemical Corp. 92

Fairfield Chemical Div., Food
  Machinery & Chemical Co. 19
Finco, Inc. ..... July
Flexo Products, Inc. 61
Floridin Co. ..... June
Fry Co., Geo. H. 97

Geigy Agricultural Chemicals 17
Glendon Pyrophyllite Co. 95
Grace Chemical Co., division of
  W. R. Grace & Co. ..... June
Greeff & Co., R. W. ..... July
Grumman Aircraft Engineering Corp. 54

Hercules Powder Co. ..... 4th Cover
Hi-Shear Rivet Tool Co. 56
Highway Equipment Co. 88
Hooker Chemical Corp. 90
Hotel Jefferson 96
Huber, J. M. Corp. 91

International Minerals & Chemical
  Corp. ..... July
International Ore & Fertilizer Corp. ..... July

Johns-Manville Co. 25

Kennedy Van Saun Mfg. & Eng. Corp. 74
KLM Royal Dutch Airlines 104
Kolker Chemical Corp. 28
Kraft Bag Co. 21

McDermott Brothers Co. ..... July
Magnet Cove Barium Co. ..... 3rd Cover
Mine Safety Appliances Co. 96
Monsanto Chemical Co. 12, 13

National Lime & Stone Co. ..... June
Nitrogen Division—Allied Chemical
  Corp. ..... 67 to 70

Phelps Dodge Refining Corp. 6
Penick & Co., S. B. 22
Phillips Chemical Co. 82
Piper Aircraft Corp. 58
Potash Company of America 3
Prentiss Drug & Chemical Co. 10

Raymond Bag Co. ..... July
Raymond Division, Combustion
  Engineering, Inc. ..... July
Reideburg, Theodore Associates 101
Renneburg & Sons Co., Edw. ..... July
Republic Steel Corp. 100
Richardson Scale Co. ..... July
Richfield Oil Corp. ..... July
Rohm & Haas Co. ..... June

A. J. Sackett & Sons Co. ..... July
Scientific Associates, Inc. 101
Shell Chemical Corp. ..... June
Snell, Foster D., Inc. 101
Southeastern Clay Co. ..... June
Sohio Chemical Co. 18
Southwestern Engineering Co. ..... June
Southwest Potash Corp. 14
Spencer Chemical Co. 16
Sperling Laboratories 101
Spraying Systems Inc. ..... July
Staley Manufacturing Co., A. E. ..... July
Standard Oil Co. (Indiana) 7
Sturtevant Mill Corp. ..... July

Tennessee Corp. 26
Texaco, Inc. 23
Texas Gulf Sulphur Co. 9
Townsend, Dr. G. R. 101
Transland Aircraft 56

Union Bag-Camp Paper Co. 84
U. S. Industrial Chemical Co. ..... July
U. S. Phosphoric Products, Div.
  Tennessee Corp. 29
U. S. Potash Co. 30

Vanderbilt Co., R. T. ..... June
Vulcan Containers 80

Weighing and Control Components, Inc. 93
West Virginia Pulp & Paper Co. 24
Wisconsin Alumni Research
  Foundation 96
Witco Chemical Co. ..... July
Dr. Wolf's Agricultural Labs. 101

TALE ENDS

HAVING just recovered from the shock of the blast against insecticides that ran in a recent issue of *Reader's Digest,* we were somewhat startled to learn recently that a year or so back we *"almost"* had an even worse story in one of the country's leading picture magazines. Built around a west coast fatality to a child, resulting from carelessness in use of a particularly toxic pesticide, the story as originally contemplated would have been a real hair raiser. It was headed off by intelligent action — in advance — the only time that anything effective can be done in a publicity matter. Those charged with responsibility simply saw to it that the true facts were presented to the magazine's representatives,—before their story was in type.

AC

Organic food is the latest Hollywood fad. Stars of the films are said to be going strong for fruits and vegetables, grown in soil uncontaminated by chemical fertilizers, fumigants, pesticides, etc. Chief pachyderm in the movement is Jim Baker, proprietor of the Awara Inn, said to be the only organic food restaurant in the world. A sample of the claims he makes for his organic menu is that a regular carrot contains only about 30 minerals, while the organic carrot would have 78. According to this authority an organic diet makes you not only healthy, but beautiful as well. "One organic carrot juice, Jim, with a dash of Vodka".

AC

The life of the entomologist has been made a little easier by the invention of a new vacuum cleaner style insect collecting machine. Developed and built by E. J. Dietrick and E. I. Schlinger of the Citrus Experiment Station, Univ. of California, this successor to the entomologist's sweep net scoops up essentially every living thing from a square foot of field. Advantages are that it makes a virtually complete sweep of the entire insect population of the test area, without being affected by such variables as position of the insect on a plant, time of day, wind, temperature, etc. Mounted on a two-wheeled push cart, it can be assembled from standard parts. (Cost about $250).

AC

Leo and Walter Staats, two farmer brothers from Sylvia, Kansas, painted a clear picture of what's wrong with the government's crop limitation program in an interview reported in the June 28th issue of the *New York Herald Tribune.* "We pour that fertilizer on. Used to fertilize only the poorest land, but now we pour it all over. If they really want to limit the wheat, they ought to limit a man by bushels, not by acres".

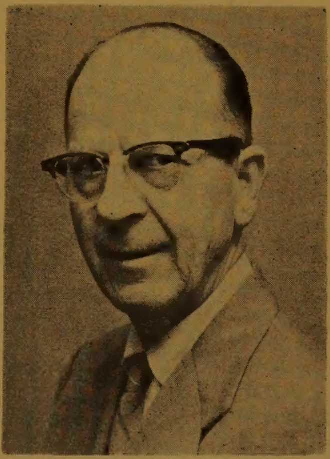
The problem of the wheat surplus is aggravated by the continually growing efficiency of the American farmer. With the aid of fertilizers and pesticides, he has steadily increased per-acre yields. In the 47-56 decade, the national production average was 17.7 bushels per acre. In 1955 it rose to 21.7, and in '58 hit 27.3. This year, it should show another big gain, which will inevitably mean another big increase in the amount of grain the government must buy and store, at the public's expense.

AC

Thousands of youngsters in the southeast and midwest have been collecting fireflies this summer, and forwarding them to Schwarz Laboratories, Mt. Vernon, N. Y., where they are used in scientific research. By processing hundreds of thousands of these firefly tails, Schwarz Laboratories produce a reagent, adenosine triphosphate, said to be very useful in many types of biochemical research. And the kids get 30¢ a hundred for the fireflies.

AC

Peru is finally reported to be running low on guano, basic fertilizer of the country since Inca times. Peru used to ship around a million tons of guano a year, but today there is an insufficient quantity to meet even Peru's domestic needs. As a result, a ten million dollar fertilizer factory has been built in Lima.



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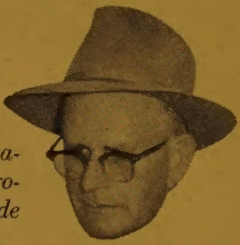
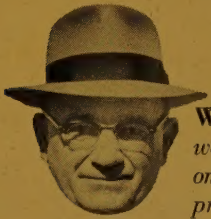


D. L. Hall, Eudora, Ark. "*The toxaphene and toxaphene-DDT control program certainly worked for me, and made me money . . .*"



W. E. Moore, Sherrill, Ark. "*We were able to pick cotton two weeks earlier on the acreage where we followed this program. It really paid off for us . . .*"

H. C. Bradney, Montrose, Ark. "*This program saves me expensive late-season applications and does an excellent job. Last year I cut my insect control costs in half . . .*"

O. L. Cox, Ruleville, Miss. "*I got on the toxaphene program early in the season and continued on a regular schedule. I believe those six early applications paid more dividends than anything we did with our cotton crop all year long . . .*"

P. E. Cloutier, Bermuda, La. "*We set one of our best crops last year, and we think the toxaphene, toxaphene-DDT insect control program was a big factor. We're basing our 1959 program on the same plan . . .*"

Morris A. Roberson, Gilliam, La. "*I like the early production and early harvest that comes with the toxaphene insect control program. We had good control all season, and I plan to use the same program this year . . .*"

Clarence R. Smith, Cleveland, Miss. "*We believe in this program. It gave us excellent insect control, saved us money, and helped us make a cotton crop under adverse conditions . . .*"

O. L. Garmon, Jr., Marks, Miss. "*I used the toxaphene program on more than 700 acres of cotton. I know you need to get the overwintered boll weevil, and this program does that. I had good insect control all year . . .*"

Insecticide salesmen have to do more than just take orders for dusts and sprays. In the Mid-South, for example, progressive formulators and dealers are showing cotton farmers how a planned, season-long insect control program based on toxaphene can be the most satisfactory—and profitable—practice. These statements from farmers already following such a program reflect the growing interest in more effective use of insecticides.

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